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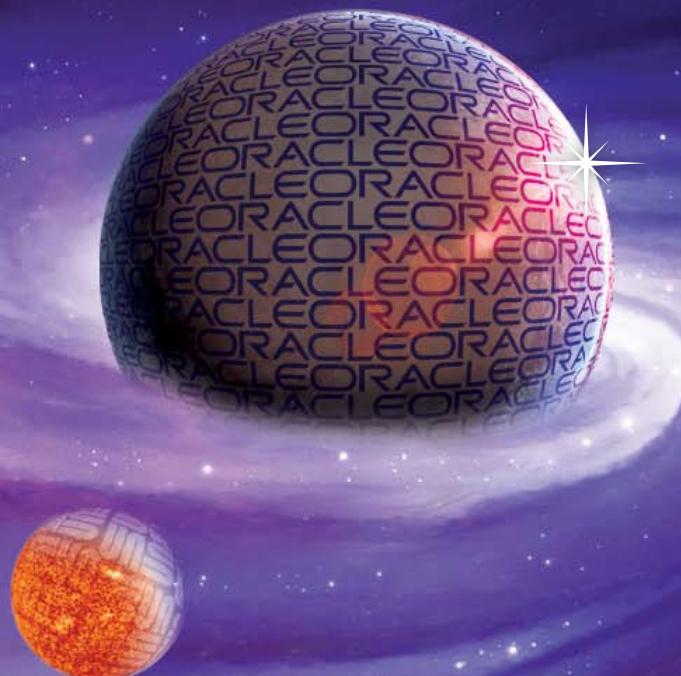


VOLUME: 07 ISSUE: 4 June 2009 118 PAGES ISSUE# 77

For You

Oracle's Gravity Pulls in Sun

The Oracle-Sun deal is like a galactic collision that promises to shake up the global tech industry. For the experts' opinions on this mega acquisition, and the various scenarios that could emerge from it in the near future, turn to Page 38.



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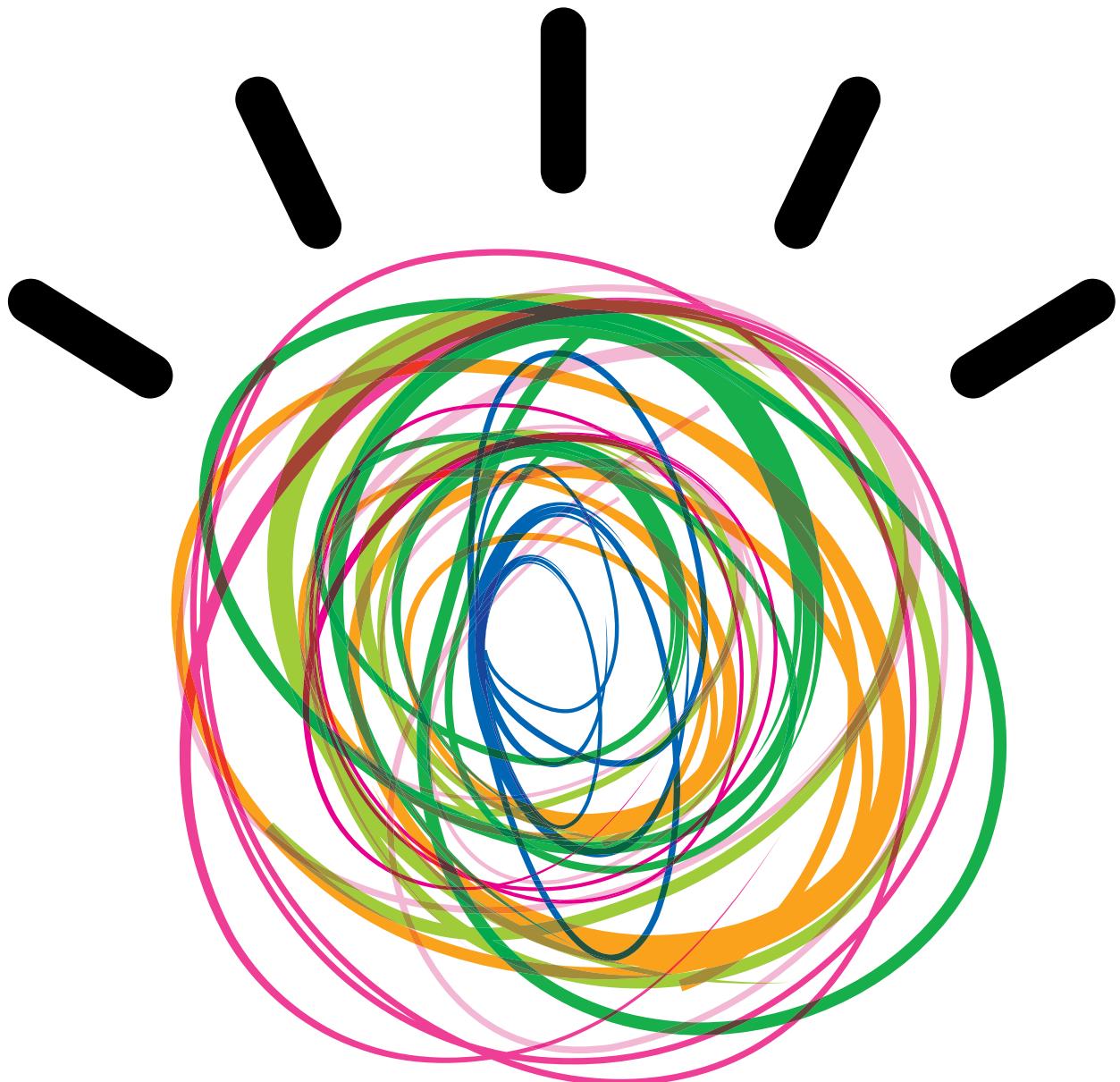
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Conversations for a Smarter Planet

How we can make our smart systems smarter.

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How much smarter? The average commodity server rarely uses more than 6% of its available capacity, while in some organizations as many as 30% of servers aren't utilized at all. IT energy consumption is expected to double in the next five years. In some cases, nearly 70% of companies' IT budgets can be devoted to managing, maintaining, securing and upgrading their systems rather than building new capabilities, services and applications.

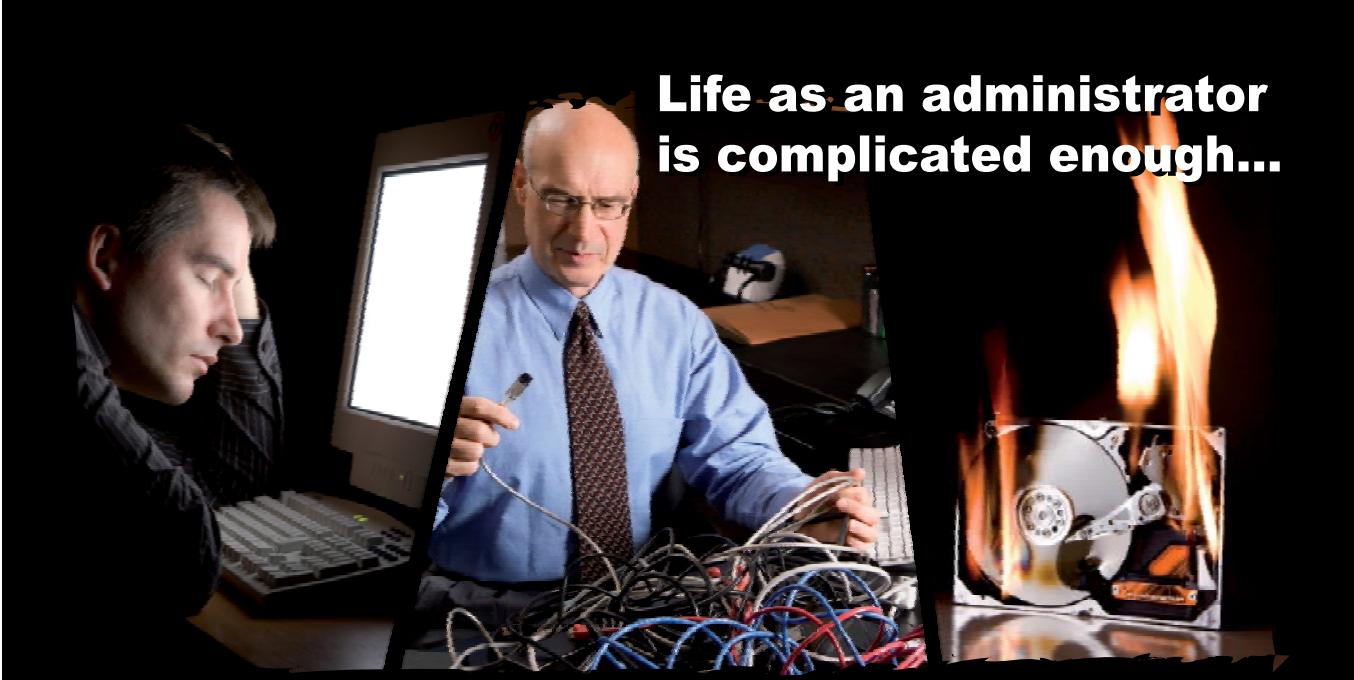
And consider what's coming: hundreds of billions of smart things – sensors, cameras, cars, shipping containers, intelligent appliances, RFID tags by the hundreds of millions – all becoming interconnected. This will enable new, highly flexible ways of interacting with customers, employees, patients and citizens from

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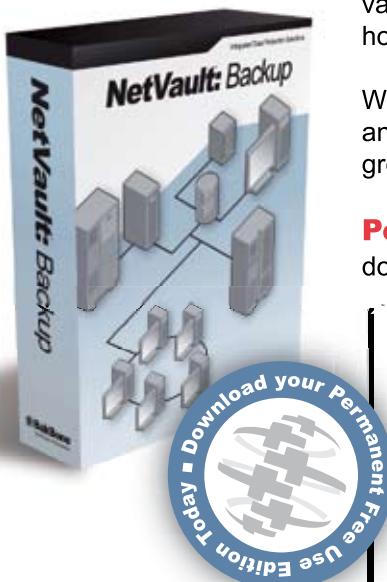
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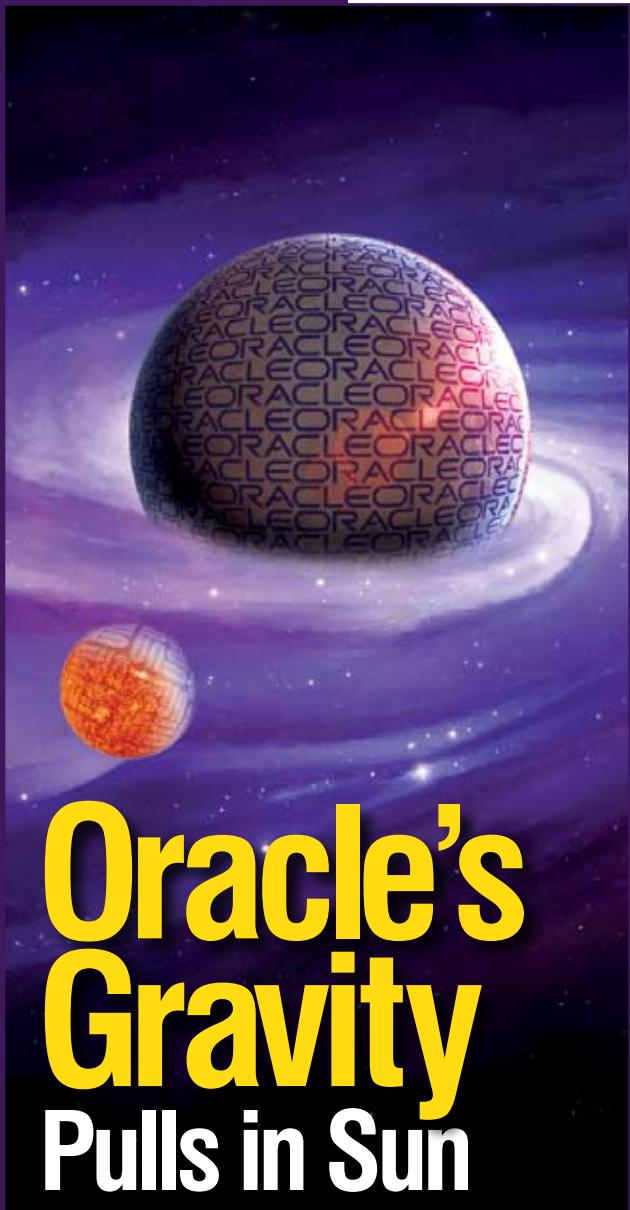


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LINUX
For You

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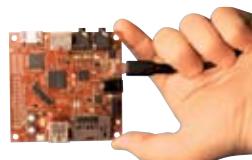
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Editorial

Dear Readers,

So how will Oracle's takeover of Sun Microsystems affect the open source world? That's the question we were suddenly faced with just as we were going to press last month. All we could do was speculate on 'what's in it for us' in the OSS community. Which is why I promised LFY readers an in-depth review of this mega merger in this issue.

Swapnil Bhartiya, a senior journalist at EFY and a passionate proponent of free software, has more than delivered on that promise. Relentlessly pursuing global open source leaders for their inputs has ensured this story is a 'must read'. Its in-depth coverage will satisfy every open source enthusiast. Across pages 38 to 47, all implications of this deal have been explored, to give you a good insight on what's expected to happen to Sun's various open source projects, under the Oracle regime.

The significant news of this month (besides Deccan Chargers winning the IPL trophy) is Congress coming to power at the centre. While we would like to refrain from expressing our personal views on any particular political party, we are certainly excited about the fact that there is now a more stable government at the centre. Therefore, all decisions that require strong political will, can now be taken.

One of those decisions (we hope) will be to accelerate the adoption of open source within the government and public sector. Young leaders at the forefront and visionaries like Dr Manmohan Singh at the helm certainly add up to the right formation at the centre. There's another reason for hope—amongst the key personnel who advise the prime minister, we have Mr Prithviraj Chavan, who has been a vocal champion of open source for a very long time—he was talking about Linux and open source in Parliament even before *LINUX For You* was launched!

In fact, there's a lot of room for constructive opposition here. The BJP and the CPI(M) can play a major role in pushing the government to accelerate adoption of open source in India—after all, both had talked

about bringing in the 'open' wave in their manifestos. While they have not been granted the opportunity to execute their plans, they still have the power, and the responsibility, to push issues of national interest. Preventing the outflow of precious foreign exchange, promoting innovation and generating employment are just a few of the benefits that open source promises any nation. These three alone ought to make open source an issue of national interest.

Young leaders at the forefront and visionaries like Dr Manmohan Singh at the helm certainly add up to the right formation at the centre

There's one more reason to cheer—we are about to re-launch LinuxForU.com. Expect it to go LIVE around mid-June. If you want to be amongst the first to get a sneak-peek, go to LinuxForU.com and drop us your e-mail ID. Before we go LIVE, we do plan on a 'premiere' for a select few. Those who register with us, will certainly be on that list. From what I have seen so far—this version rocks. But then, the final verdict is always yours.

Best Wishes!



Rahul Chopra
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You said it...



Announcement: *Hi folks! We've been getting some requests from our readers to bundle x86-64 OS instead of the regular x86 OS that we bundle every month. The reason we have only been bundling 32-bit OSs is because we believe a 64-bit OS may not support the processors that many of our readers use. However, do consider this as an open call for votes on whether you, the readers, would prefer a 32-bit OS or a 64-bit OS. Please send us your feedback at lfyedit at efyindia dot com by July 20, 2009.*

 I picked up a copy of *LFY* April 2009 after quite a few years (definitely more than 12 months and it was only because I wanted to grab the Debian 5 Lenny DVD for personal use), and I must say I was delighted to see the magazine has improved by leaps and bounds. The last time I read *LFY*, I saw definite potential in what seemed to be a budding magazine trying to create a niche for itself in the Linux/Open Source world. Now, you guys pretty much seem to be at the top and you definitely rock.

I can't seem to recollect the last time a magazine that I picked up took me over two days to read and complete (and believe me—I practically read every article and every contribution in there). The entire content kept me captivated and thrilled. I would like to consider myself a geek who experiments with technology just to be aware of the developments around the world. My day-time job is that of a banker, wherein I rarely, if ever, deal with anything remotely technical in nature.

If time does permit, I would seriously consider a long-term subscription with your magazine—with the superb quality of content

that you guys now put out. I just wanted to let you guys know that please continue doing the excellent work—it's been a pleasure to see that quality magazines still do get published.

—**Somani Kisalay, kisalay.
somani@citi.com**

ED: *Thanks for your encouraging feedback. We hope you'll continue to send us feedback on the content of the magazine—things you like, you dislike, and what you think is missing...*

 The editorial of the May 2009 issue left me a bit worried. Sun's acquisition by Oracle is indeed big news, and that is part of the cause for concern. While companies developing open source software are definitely helping the 'ecosystem' because of their powerful support, I believe we should not lose sight of the main idea behind free software. Free software was nothing new at the time [Richard] Stallman started the movement, but the movement was required because companies were commercialising software, threatening the programming culture and its free sharing of source code. The members and supporters of the free software community have always been mostly people who care deeply about the joy of programming and defending their freedom.

Today, when free software has reached such heights, it is essential for the community to ensure that commercial companies do not topple it over. And for that, the foundation needs to be strong. Licences like the GPL do protect against the 'locking up' of software, but we need to ensure that the software we create gets this protection by actually using

such licences. It would be a pity and a shame if commercialisation gets the better of the free software movement.

—**Saurav Sengupta,
Chandigarh**

 I have been a subscriber of *LFY* right from its first issue and have tried various flavours of Linux, thanks to your magazine. Right after installation, I always first try the card games (to see whether there is any improvement) and multimedia support.

I always felt that PCLinuxOS is the best for newcomers and the one in the current issue is even better. Windows partitions are mounted automatically, network cards are installed without a problem and, unlike other distros, multimedia support is comprehensive. FLV videos in Windows partitions are played without any need for other codecs (although the lip sync feature was missing). I wonder why VLC player is not included. Also, the UI of the card game has improved tremendously. Of course, LAN modems are not supported and I gather that it is a pain to install drivers for them.

On an entirely different track, I shall be happy to get some feedback about the *bsnl.in* portal. Recently, I applied for a second BSNL connection. The instrument was delivered the next day and the number allotted within a day after that. However, they took more than a week to allot the broadband password. On connecting, I faced a peculiar problem—a few sites such as BSNL's own *DataOne.in* as well as *ICICIBank.com* fail to open. (ICICI sites open at times after a long delay.) GMail also has some problem. I suppose that the BSNL portal must be a new one, and any help from the readers on how to get around the problems

You said it...



I've mentioned here is welcome. Meanwhile, I shall try to take the help of BSNL engineers. I have tried out two modems (the BT wireless modem/router and Billion) with the same result.

—**V.S. Nagasayanam,**
vsayanam@gmail.com

ED: Thanks a lot for the valuable feedback. As for BSNL—we do not have much experience on this front, and thus we're sharing your e-mail with our readers. If any of you also use the same Internet service, kindly send Mr Nagasayanam your feedback.

 I have been a subscriber of LFY since August 2003. It is very heartening to see the magazine grow, especially in the mix of articles that try to address the newbie, administration, and developer reader segment. Kudos to you and your team for bringing out a great edition every month.

I would like to save all the issues but physically, it is not possible. Therefore, can I request you to create an archive of all the past issues and release it on a CD (HTML), ASAP. *PCQuest* has been doing this with its past issues, and periodically includes it with the CD/DVD that accompanies the magazine. I think it's time for LFY to do the same and I sincerely hope you will agree with that.

—**Arun Khan**

ED: Thank you for your compliments. It's a great feeling to hear that we're still able to cater to the needs of a wide audience.

As for the PDF archives in our CD, we're in the final phase of deploying *LinuxForU.com*, where the team is busy in bug-squashing WordPress—we're planning to launch it by June 10th. Once that is done, we'll have the archives of the older issues available steadily

over the coming months. But yes, we agree: PDF archives would be cool too. Maybe we can do that once a year—with the January issue?

Arun replies: Great to hear about your archive plans. One suggestion: unlike other magazines, just keep the "current" and perhaps "current - 1" issues offline and the rest available on the Web. In the same vein, if you publish an e-magazine version (PDF) without the CD, perhaps at a reduced subscription rate, you can attract international subscribers. LFY can go global and attract authors from other parts of the world. Please give it some serious thought.

I had suggested this to the *Linux Journal* (US) when I moved back to India, but they have said nothing about it yet. Getting a bound copy delivered to India is untimely and cost prohibitive.

I agree with the idea of PDF archives of previous years in the January issue. You can charge for the cost of the CD—serious OS enthusiasts would not mind paying. *Linux Journal* is doing this.

ED: The plan is to keep only the current issue unavailable. So, everything from the "current - 1" will be online. When we launch the website in June, initially it'll have only the issues from 2009. Steadily we will upload the older issues as well.

 I just went through the article, "Doc Till You Drop" in LFY, May 2009. I have a couple of suggestions. It may be difficult to knock on the doors of so many government offices. But as you know, 80 per cent of the bureaucrats read newspapers and magazines, and these media surely have columns on computers, IT, the latest gizmos, etc, which are widely read.

The people in government get swayed towards proprietary products because 99 per cent of the articles are only on Windows. Please write to all the editors and slaves of Bill Gates to stop covering only Windows. Why can't every second article be on FOSS, in public interest?

Second, Linux developers need to look at video, video-based IM and chat, and MCU-based video on Linux clients. As long as you do not have these features on Linux, switching to this platform is going to be tough. Since most Linux geeks do not take video very seriously, this attitude benefits Windows. Why can't Yahoo base its Messenger only on Linux? Why was Google Talk and Google Earth released only for Windows first, and on Linux only a year later?

Linux is being given second-grade treatment even by Linux geeks, and all those companies who make money from it.

Though you ended your article with "...knock, knock, knocking on heaven's door," I feel like "knocking on Linux geeks' doors..."

—**Mk Yadava IFS, MD,**
AMTRON

Niyam replies: Thank you for writing in and sharing your insights and suggestions on the *OpenOffice.org-for-India* debate. Please see my *FreedomYug* column for June 2009 on how we all may take it further.

Please send your comments or suggestions to:

The Editor

LINUX FOR YOU Magazine
D-87/1, Okhla Industrial Area,
Phase I, New Delhi 110020

Phone: 011-26810601/02/03

Fax: 011-26817563

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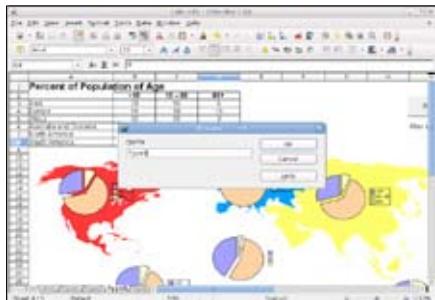
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Technology News

OOo 3.1 now more than a match for MS Office

It's been less than a year since Sun Microsystems' OpenOffice.org hit its major 3.0 release, but the next version of the open source, cross-platform productivity suite is already available, complete with a slew of feature enhancements and performance tweaks. The first thing you'll notice about the new OpenOffice 3.1 is that it just looks better—the program menus, letters and images it displays are sharper and clearer. This notable enhancement is thanks to the improved rendering of on-screen graphics through anti-aliasing, an advance that applies to the entire suite, but that should prove particularly pleasing to users of the product's presentation component, Impress.



A few improvements that OOo has done on the graphics front are anti-aliased drawings, solid dragging (now you can see the transparent image while dragging, and not just an outline) and also translucent selections in Writer.

Feature wise, OpenOffice.org 3.1 matches up fairly well with Microsoft's Office. In addition, the OpenOffice.org team has done a lot of work to make its suite compatible with MS Office's traditional binary and newer OOXML file formats. With the latest option to 'Reply to Notes', improved support for bi-directional scripts and the introduction of grammar checking, Writer has evolved into one of the best and most advanced open source word processors in the market.

Other interesting features that you will surely look forward to are an introduction of Macros and syntax highlighting in Base, 'Formula hot hints' in Calc and also a very notable performance boost to every OpenOffice.org application. Do download the office suite and let us know if you'd like to review it for us!

Samsung unveils Android smartphone

Samsung Electronics has launched the I7500—its first Android-powered mobile phone. The handset features a 3.2-inch (8.1 cm) Active Matrix OLED (AMOLED) touchscreen and 7.2Mbps HSDPA and Wi-Fi connectivity, giving users access to Google Mobile services and full Web browsing at blazing speeds. It offers users access to the full suite of Google services, including Google Search, Google Maps, Gmail, YouTube, Google Calendar and Google Talk. The integrated GPS receiver enables the use of Google Maps' features, such as My Location, Google Latitude, Street View, local search and detailed route description. Besides these, hundreds of other applications are available in the Android Market.

The Samsung I7500 comes with the latest multimedia features. Along with supporting a 5-megapixel camera and various multimedia codec formats, the I7500 also provides a long enough battery life (1500mAh) and a memory capacity of up to 40 GB (internal memory: 8GB, external memory, that's upgradeable up to 32GB) to enjoy all the applications and multimedia content. The phone also boasts of a slim and compact design, being just 11.9mm thin. It also includes a 3.5mm headphone socket.

The Samsung I7500 will be available in major European countries from June 2009. The company has not revealed pricing for the device.



Xen 3.4 promises reliability & availability

Xen.org has released a new version of Xen hypervisor. Xen 3.4 hypervisor offers significant enhancements in the following areas:

- Xen 3.4 contains the initial XCI code release providing a base client hypervisor for the community to extend and improve.
- The new version delivers a collection of features designed to avoid and detect system failures, provide maximum uptime by isolating system faults, and provide system failure notices to administrators to properly service the hardware/software.
- Xen 3.4 improves the power saving features with a host of new algorithms to better manage the processor, including schedulers and timers optimised for peak power savings.

Xen 3.4 is currently available via free download for developers at the Xen.org website: www.xen.org/download.

Qt open for community contributions

Nokia has announced that the Qt source code repositories are open to the public and that Qt developers now can help guide and shape the future development of Qt by contributing code, translations, examples, etc, to Qt and Qt-related projects. In order to help manage the contributions, Qt Software has launched a Web-based source code management system based on the Git and Gitorious open source projects, which is available at qt.gitorious.org.

No gatherings or get-togethers, yet 6 billion conversations everyday.

Making the impossible possible is a way of life at Yahoo! Small or big, whatever be the idea, we bring it to life. No wonder, Yahoo! has constantly conceived and delivered world-class products that touch the lives of over 500 million users. Whether it's email, news & entertainment, sports, music or just about anything else on the net, people turn to Yahoo!.

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We are presently looking for expert Linux programmers with BTech/MTech/MS/PhD in Computer Science for the following positions:

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Performance Architect - Performance Engineering

The Performance Engineering team is an expert group of systems programmers that analyzes and improves

performance and scalability of Yahoo! Search, Advertiser-Publisher Exchange and Grid Technology. This group is currently building presence in Bangalore and is hiring Architects and Principal Engineers.

The ideal candidate should have: • M.Tech/MS/PhD in Computer Science with 9-16 years experience • Deep knowledge of Unix/Linux OS internals or JVM internals • Proficiency in Systems Programming using C/C++ or Java • Knowledge of Computer Architecture of modern Intel/AMD processor/chipsets

• Background in High Performance Computing (HPC) or Performance Optimizations is a plus • Knowledge of Apache Hadoop internals (<http://hadoop.apache.org>) is a plus

Tech Lead - Linux Engineering

The yLinux team is the "Linux Center of Excellence" for all of Yahoo!. This team is responsible for Linux strategy, support and development. This team works closely with Yahoo! properties, Linux vendors and the open source community to provide a stable, secure and scalable Linux infrastructure to Yahoo!. The team comprises of kernel, systems and release engineers that provide solutions spanning Linux Kernel support, migration of code from FreeBSD to Linux and packaging public domain software.

The ideal candidate should have: • B.Tech in Computer Science with 7+ years experience, MTech/MS is a plus • Extensive development experience on a Linux environment • Good understanding of building, packaging software on Linux, including RPMs • Excellent C/C++ development and debugging skills • Background in porting source code to Linux is a plus • Scripting skills in Perl/PHP & Unix shell programming is a plus

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Technology News

Breathe in some fresh 'Air' with KDE 4.3 beta 1

Seems like the wait for the new version of KDE4 is almost over within the KDE Community after the first preview of the third iteration of the KDE4 desktop, applications and development platform—KDE 4.3 Beta 1. The KDE team is now in bug-fixing mode in order to provide a smooth KDE 4.3.0 to end users in late July.



Highlights of KDE 4.3 are:

Integration of many new technologies, such as PolicyKit and Geolocation services.

New window animation effects, a more usable run command pop-up and many new and improved add-ons in Plasma.

Many bug-fixes and improvements across all applications and more integration of features introduced since the release of KDE4.

KDE 4.3 will also introduce a brand new desktop theme dubbed Air, replacing Oxygen. According to KDE Pinheiro [pinheiro-kde.blogspot.com/2009/02/air-and-kde-43.html], "Air is supposed to be different

from what Oxygen is, something that tries to appeal to a user base looking for a more 'sexy' experience than Oxygen (yeah I know you are out there :)), but to still have the capability of merging nicely with what we have now... KDE will very shortly become the desktop you need and not the desktop we think you need."

Note that KDE 4.3 Beta 1 is not suitable for end users. Its sole purpose is gathering feedback and testing. Visit the KDE 4.3 beta 1 Info Page at kde.org/info/4.2.85.php to get started.

Moblin 2.0 beta for netbooks and nettops

The Moblin steering committee has released Moblin v2.0 beta for netbooks and nettops for developer testing. With this release, developers can begin to experience and work with the source code of the visually rich, interactive user interface designed for Intel Atom-based netbooks. Moblin is built using GNOME Mobile Technologies, and supports existing Linux desktop applications.

Moblin v2.0 features include a new, visually rich user experience, optimised for netbook and nettops, building on the latest FOSS graphics technologies, such as Clutter, DRI2, and KMS. The m_zone, acting as the 'home screen' panel, provides instant access to your synchronised calendar, tasks, appointments, recently used files, and real-time updates from your friends on social networking sites. Besides this, aggregation of your social networking content provides you with the ability to see your social networking activities on one screen. There's also a Web browser optimised for the Moblin 2.0 netbook user interface; a 'zoomable' media player; a user interface for connection management; an updated connection manager (ConnMan); and, of course, support for Linux desktop applications.



According to the announcement, the Moblin images [moblin.org/downloads] are being tested with the following platforms: Acer Aspire*One, Asus eeePC* 901, 1000H, Dell Mini 9, MSI Wind, Lenovo S10, Samsung NC10, HP Mini 1010 and 1120NR (wired networking only for now).

RHEL 4.8 released

Red Hat has released the eighth update to RHEL 4. The new version sports improved virtualisation performance and scale, with optimised device drivers for RHEL 4 virtual guests deployed on the KVM hypervisor that's supposed to be included in future RHEL 5 releases, apart from virtual guest support for up to 256 disk devices (increased from 16). It also has improved Windows interoperability and filesystem support due to numerous Samba enhancements; performance improvements due to three new 'kernel tunables' that allow users to optimise application performance by reducing latency and improving utilization; and enhanced developer support with an updated GNU Compiler Collection that allows users to compile applications on RHEL 4 with compatibility with RHEL 5. This helps them prepare for moving applications to the newer Red Hat releases. More details can be found at www.redhat.com.

New CUDA Toolkit 2.2

NVIDIA has released version 2.2 of the CUDA Toolkit and SDK for GPU computing featuring a visual profiler, improved OpenGL interoperability, zero-copy, a hardware debugger for the GPU, etc. The CUDA Visual Profiler is a graphical tool that enables the profiling of C applications running on the GPU. This latest release of the CUDA Visual Profiler includes metrics for memory transactions, giving developers visibility into one of the most important areas they can tune into for better performance. The release also delivers up to 2x bandwidth savings for video processing applications.

Technology News

Flock 2.5 targets Twitter and Facebook Users

The Flock development team has released a newer version of the social Web browser. Flock 2.5 [www.flock.com] makes both sharing and discovering content fast and easy. To share content, you simply drag and drop URLs, photos, videos, text or other content you find on the Web to a friend's Twitter, Facebook, MySpace or other profile in Flock's People Sidebar, and it is instantly shared. Flock now also



comes with Twitter Search that allows you to save all of your Twitter searches and keep them in one place, making the discovery of content automatic and straightforward.

The new FlockCast capability allows you to 'broadcast' your public actions to multiple locations at once, eliminating duplicate effort. Flock makes posting and promoting your

own blogs into Facebook effortless; drag and drop content you find anywhere on the Web into your favourite blog and Flock posts it to your Facebook newsfeed. You can also automatically post your Tweets, status updates from MySpace, Bebo and other networks, along with blog posts and photo uploads to Facebook. And when you share a URL in a Twitter message, Flock automatically shortens the URL—eliminating the need to shorten the URL with yet another site.

Flock 2.5 also includes Facebook Chat for instant messaging with friends. Facebook Chat lets you see when other people are online and makes sharing your discoveries with them easy, so you can remain connected while you travel across the Web. You can also drag and drop photos, videos, links and text into your chats, making your Web experience simple, social and fun. Videos of the new Flock 2.5 can be found at www.flock.com/tour/new.php.

Develop widgets with Maemo 5 Beta SDK

Nokia has released the Maemo 5 Beta SDK that will, among other things, also enable the development of widgets for the Maemo 5 Desktop. Maemo 5 is the next major release of the Linux platform developed by Nokia in collaboration with some of the best open source community projects. The key new features are: OMAP3 support, HSPA data connectivity, high-definition camera support, hardware-based graphics acceleration, etc. The SDK still includes a simplified UI implementation of the desktop and the application Menu. The Desktop Edit Mode is now enabled in order to ease the development and testing of desktop widgets.

This release comes with the first draft of the Development Manual. Also, a new example application and desktop widget are provided to help developers getting familiar with the new UI style driven by finger touch interfaces. The developer documentation, including new code examples, will be updated regularly, independent of new SDK releases. Point your browser to maemo.org/development/sdks to grab the latest release.



GStreamer plug-in for OMAP35x processors

Minimising the complexity of software integration with a uniform open source multimedia framework, Texas Instruments (TI) has announced a new GStreamer plug-in for developers designing with OMAP35x processors and digital media processors based on DaVinci technology. Praveen K Ganapathy, director, business development, Texas Instruments India said, "The plug-in helps optimise systems to utilise the hardware accelerators or the digital signal processor (DSP) for processing-intensive tasks, such as video and audio decoding/encoding. This frees the ARM to handle other tasks so developers can deliver a feature-rich multimedia experience with improved Web browsing and video streaming through products such as media players, video editors and capture encoders."

The TI GStreamer plug-in can be downloaded at www.ti.com/gstreamer-pr.

MontaVista introduces MontaVista Linux 6

MontaVista Software has released MontaVista Linux 6. The new version provides a complete embedded Linux development environment comprising Market Specific Distributions, development tools, and the support and maintenance required by developers to fully leverage the semiconductor Linux technology and resources from the open source community. This approach to embedded Linux is fully aligned with the embedded Linux supply chain for the first time. MontaVista Linux 6 is in use by beta customers currently and will be generally available in July 2009.

Q & SECTION

Q How do I add new TTF fonts in KDE?

—Maurice Pacheco,
Mangalore

To add new fonts, open the Konqueror file manager (or Dolphin, if you're using KDE4) and enter fonts:/ in your location bar. The file manager will display two folders, namely Personal and System. If you want these fonts to be available to all system users, then copy your fonts to the System folder, otherwise to the Personal folder.

Q I have a system in which openSUSE 10.3 is installed. It was working fine for two months, but now it lands only in verbose mode when booting the PC, and then asks me to repair the filesystem. Please tell me how I can solve this problem without reinstalling the system.

—Ananthakumar, akr_linux@rediffmail.com

The simplest way is to repair your system using the repair mode from the openSUSE 10.3 install DVD. Boot from the DVD and find out the options.

Q I have installed openSUSE 11.1 from the DVD bundled with *LINUX For You* magazine. The installation was flawless on my new Compaq Presario V5000 laptop. It has a Celeron processor with 1 GB of RAM. After installation, both mouse and keyboard were working fine but now I have noticed that the double quotes key has got interchanged with the 'at the rate' (@) key. I also have Windows installed on my system and the keys are working fine there. What could be the problem?

—Neelabh Anand, Patna

It seems that you have selected the wrong keyboard type during installation (most probably the *English UK* keyboard). Launch the YaST administration and select *Keyboard Layout* from the *Hardware* section and set *Layout* to *English US*. Click OK and restart your X server to make the changes take place.

Q The anniversary issue (February 2009) of LFY that carried the article on Richard Stallman impressed me very much. I have started reading about him and recently visited his homepage. After reading about his various principles, I have been inspired to change. I have removed MS Windows XP from my system and have resolved not to use proprietary software. I am planning to install ReactOS, an open source clone of Windows. But I don't know whether it is a complete OS. (Can it be installed on

computers?) The reason I'm asking this is that the file size of ReactOS is a mere 32 MB. Can I install any software that came with free software for Windows DVD (in November 2008) in it?

I'm interested in ReactOS because, although I have Kubuntu and OpenSolaris in my system, I don't find them easy to work on after having used Windows for so long. For example, Kubuntu doesn't have a media player to play MP3 files and others. This is the real reason why many people don't switch to GNU/Linux, I guess.

—Ramasubramanian Venkiteswaran, ramanvenkatamani@gmail.com

Wow! It's great to read that you've dumped Windows for good. The idea is to depend (if at all) on proprietary software as little as possible.

MP3s do not work out-of-the-box in some GNU/Linux systems not due to their inability to play these media files, but because these codecs and plug-ins are not available out-of-the-box due to some patent and licensing restrictions that are applicable in some parts of the world. You can certainly enable these features by downloading the appropriate codecs and plug-ins from the Ubuntu repository. Take a look at help.ubuntu.com/community/RestrictedFormats for details. As for ReactOS, it's still in the alpha testing stage. It's okay if you'd like to test the OS, but we wouldn't recommend that you bet on an alpha-quality OS for everyday use. But, of course, please do give it a try, and see how it fares.



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Jackalope Seems to be Jaunty Enough

Ubuntu 9.04 lives up to its promise of bringing in up-to-date FOSS offerings.

*J*t has not always been a bed of roses for Ubuntu, which has its share of brickbats. And yet, there is something about it that attracts users. It might be the simplicity of not having to decide between multiple editions of the same release. Ubuntu's professional look and feel, coupled with its coherence, could be the reason. It might even be the simplified presentation of a network of technologies. Perhaps it's a bit of all these attractions. Yet, love it or hate it, it remains one of the most popular distributions ever.

Personally, I use it because... well, I have mentioned enough reasons. And so, when version 9.04, the Jaunty Jackalope was released on April 23, I downloaded it the very same day and set about trying it on my new laptop. Here is an account of my (ongoing) experience with Jaunty.

The machine

My laptop, on which I installed Jaunty, is a Dell Inspiron 1545 with the following specs:

- Intel Core 2 Duo 2.0 GHz processor
- 3 GB RAM

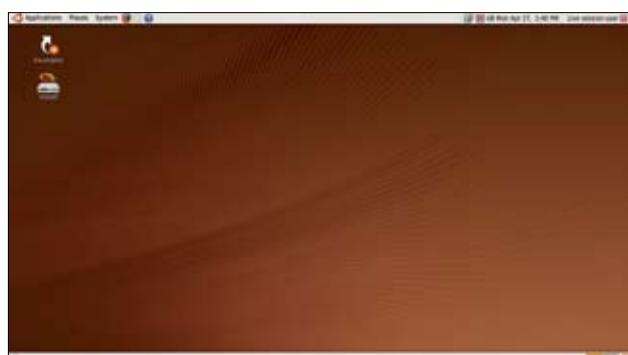


Figure 1: The default desktop (live session)

- 320 GB SATA hard disk
- Integrated Intel graphics
- 15.6-inch (39.6 cm) wide screen with a native resolution of 1366x768
- 10/100 Mbps Ethernet port
- Bluetooth and Wi-Fi
- 1.3 mega-pixel Web cam

First impressions

I downloaded the 32-bit version of the live CD (which is bundled with this month's LFY). Booting with the CD revealed the first difference from several preceding releases. The boot splash has changed, replacing the graduated progress bar with a thinner, colour-varied one. Next up, the GDM login screen has also changed, and so has the default wallpaper. Both now look much more professional than the previous ones.

The following is a list of the major goodies included this time:

- Linux 2.6.28
- GNOME 2.26.1
- Firefox 3.0.8
- OpenOffice.org 3.0.1
- ext4 file system support (the default is still ext3)
- Amazon EC2-compatible cloud computing support
- A version specially designed for net books

ext4 support is one of the major changes hitting distributions these days, but there are still occasional problems like data loss and lockups, so ext3 is the default. A technology called Eucalyptus allows you to set up a cloud computing facility, but it may not be ready for full-time use yet. This time, the Ubuntu team has also created a special version of the operating system for net books.

Apart from this, Brasero is also updated, and a tool called Computer Janitor is included, which is basically a system clean-up utility, capable of removing orphan packages, for

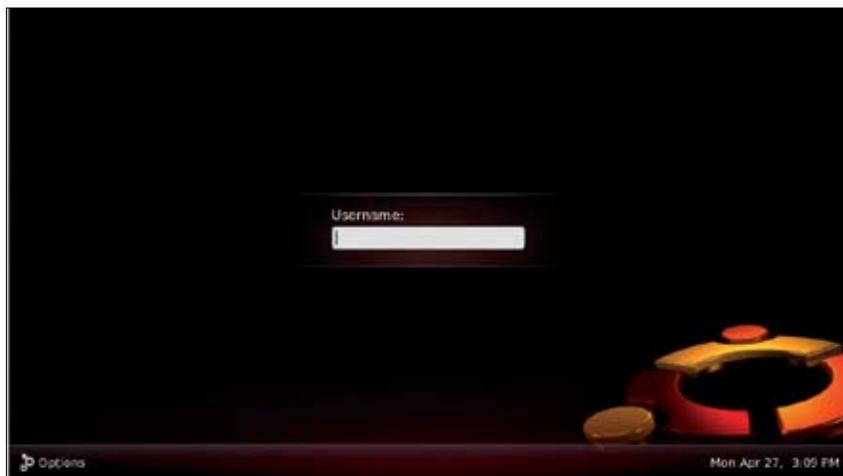


Figure 2: Jaunty's login screen

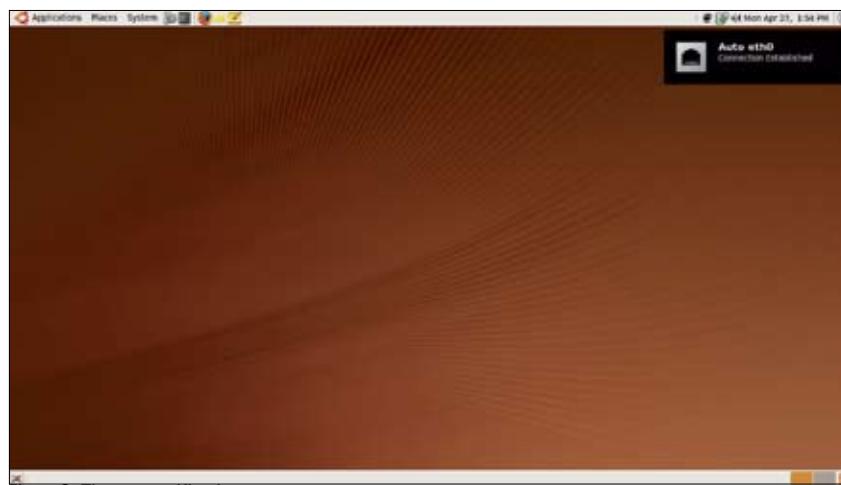


Figure 3: The new notification system

instance. The Droid font set, originally designed for mobile devices, is now available as *ttf-droid* in the repositories. Its sans-serif version is very clean and nice looking. You may wish to try it out as your UI font.

All, however, is not well as far as my laptop is concerned. I found that the in-built Bluetooth device was recognised only if it was switched on before Ubuntu booted. Even then, if I switched it off while logged in, it was not recognised after switching it on again. My old USB Bluetooth device was recognised correctly, so I decided to use that instead and, finding all else to be working correctly, I started the installation from the boot screen after a reboot.

The installer started from the boot screen through the *Install Ubuntu* option, which now occupies the entire screen. The installer's time zone selector

has also been changed to a nice looking flat zonal map, which makes more sense for time zones than the earlier maps. The manual partitioner also allows you to select the ext4 file system if you want. Other than a cosmetic change in the keyboard layout selector, the rest of the installer is pretty much the same.

Inside the system

As I rebooted into the newly-installed system, I noticed that the boot-up time has also decreased, and going from boot screen to login to desktop is pretty quick.

After I had logged in to the installed system, I connected to the Internet to refresh the repository cache, and here I found the new notification system working as advertised in the technical overview on the Ubuntu website. Canonical has come up with a new system to notify users on matters like

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Conditions Apply



Figure 4: The Computer Janitor

network connection status changes, print job status changes, new e-mails, etc. The default balloon tips no longer appear. They have been replaced by black rectangles appearing near the top right corner of the screen.

The software, called Notify OSD, has received a not-too-excited welcome from the community. Some say it is useless because its position cannot be changed and it cannot show timeout or button widgets like the balloons, while others say it will be fine only if the work goes upstream so that it is included in standard GNOME. On the other hand, most people do like its appearance and the fact that it does not create overlapping notifications. For me, it doesn't matter that much as long as it works correctly.

The software update system now does not show the balloon tip informing of available updates, but launches the Update Manager directly if updates are available. I don't know whether this has been done to prevent out-of-place notifications now that Notify OSD is being used, but the release notes say that you can restore the old behaviour by issuing the following command:

```
gconftool -s --type bool /apps/update-notifier/
auto_launch false
```

Synaptic, the package manager, has also acquired the ability to show screenshots of programs, although many programs don't have screenshots available.

On board, the rest is as usual. The stock software is included and the hardware is detected correctly, including my native screen resolution. My system does not have a separate graphics card, but the unobtrusive 3D effects of the user interface worked smoothly. Suspend/resume worked normally, and there were no freezes. Not finding any updates for my erratic Bluetooth device, however, I tried an alternative called Blueman (Bluetooth Manager), available through a Launchpad PPA (Canonical's custom software packaging service). Its homepage is at blueman-project.org. It replaces *bluez-gnome*, GNOME's default Bluetooth software, and is somewhat more feature-laden. However, it could do nothing for my in-built Bluetooth device, so I changed back to *bluez-gnome*.

You may try it as an alternative if you work with Bluetooth frequently. I settled for my old and trusty USB Bluetooth device. The problem with the in-built one seems to be at a lower level—the kernel perhaps. The problem did not occur in Ubuntu 8.10, but it does occur in Fedora 10.

After a couple of days, I tried the Computer Janitor and it showed me a package that could be removed because it had once satisfied a dependency but was no longer needed now. The Janitor is good to have around to clean up the system if you want to, but it is not likely to be used too frequently since this is GNU/Linux, and especially since this is Debian (I usually remove packages completely, including configuration files, when I uninstall something on Debian).

Good enough

Debian-based systems generally don't depart from the quality levels their parent upholds. It needs to be seen in which direction Canonical's innovations like Notify OSD will go, but on the whole, even in version 9.04, they have maintained their tradition of providing up-to-date, but stable software without show-stopper bugs. The codec installation for proprietary multimedia formats works as usual, except that, in addition to the

flashplugin-nonfree package, which has transitioned to *flashplugin-installer*, an *adobe-flashplugin* package is now available for Adobe Flash. Since it is not clear which one should be installed, I selected *adobe-flashplugin* seeing that it is supported by Canonical, whereas the others are not.

Ubuntu has always been a distribution that's meant to be free as well as suitable for daily, real-life use. It has no paid version carrying proprietary stuff or extra facilities. It does not force experimental features on users and is not a restrictive, special-purpose system. Of course, there is a place for each of these too, and innovation, especially, has been a defining characteristic of GNU/Linux. However, we need the likes of Ubuntu too. I believe it is the integral feel, stability and comprehensiveness of the system that makes Ubuntu viable as an operating system for day-to-day use. At least, all of this has been true of the Ubuntu releases till now. I don't know what the next version, the Karmic Koala, will bring to the table (the newly planted Eucalyptus will hopefully be palatable to the Koala by the time he arrives ;-)). Until then, the Jackalope seems to be jaunty enough!



Ubuntu 9.04



Pros:

Speed, stability, ease of use, professional look and feel, easy support for proprietary hardware and software, high speed repositories.

Cons:

Graphical system administration tools not suitable for advanced use, installer changes hardware clock to UTC without asking.

Platform:

x86

Price:

Free (as in beer)

Website:

www.ubuntu.com

By: Saurav Sengupta

The author is a final year IT student and a software developer with an interest in both application and system programming. He can be reached at saurav.sengupta01@gmail.com.



A face off between
Mandriva Linux 2009.1
Spring and the release
candidate of Windows 7.



Fight Club

The war has begun. Quite literally. The final release of Windows 7, the latest (and greatest?) version of Windows is just months away. We laid our hands on the RC (release candidate) available for free on Microsoft's website, and took it for a spin against Mandriva 2009.1 Spring. Who won? The results are most surprising!

The hardware platform

We tested out both the operating systems on a pretty standard multimedia PC. The specs of the system are given below:

- Processor: Intel Core2 Duo E7200 @ 2.53GHz, 45nm Core Fabrication, without Intel VT.
- Memory: 2GB Transcend DDR2-800MHz JetRam
- Chipset: nVidia nForce 630i MCP
- Graphics (Onboard): nVidia nForce 630i/GeForce 7100
- Graphics (PCIe): nVidia GeForce 9400GT
- Networking: nVidia nForce MCP73 Networking Controller (Realtek RTL8139 Chip)
- Sound: Realtek AC'97 8 Channel High Definition On-board Audio (ALSA: Intel_HDA)
- Hard Disk (Primary): Seagate Barracuda 7200.11 320GB SATA2

- Hard Disk (Secondary, Hosting our OSs): Western Digital Caviar 160GB 7200RPM SATA2
- Display: Samsung SyncMaster 510N (15" or 38.1.cm, LCD-TFT, VGA Connection)
- Mouse and Keyboard: Microsoft Digital Media K/B and Microsoft Wireless Optical Mouse

Now that you know the specs of our system, it's time to move on!

The packages compared

Both Windows 7 RC and Mandriva 2009.1 Spring (Free) come on single-layer DVDs. Windows 7 is a smaller download at 2.35 GB, whereas Mandriva weighs in at 4.34 GB, or 1.99 GB more. Both are ISO images, and have to be burned onto a disk.

Installation: Head-on

We started out by creating two empty unformatted partitions of 25 GB each on the shiny new caviare. Then, after starting the countdown timer, we started the computer with the Windows 7 RC DVD in the drive. A little while later, a plain text message greeted us: "Press any key to boot from CD or DVD" with a growing number of dots after it (it's supposed to stay five seconds, after which it

automatically boots from the hard disk). After a jab at the *Enter* key, the screen went blank.

Not for long. Just a split second later, a screen with the message "Windows Is Loading Files" along with a progress bar appeared. It then completed a graphical boot screen and displayed four balls converging into a Windows flag and a lot of HDR effects. The screen was set at the full 1024x768 pixels resolution, with 32-bit colour. Too little, too late: we already have this animated graphical boot capability in RHGB, which was demonstrated by Fedora 10.

The installer took almost a minute to start, which is way too long for our liking. Anyway, once it was up, a screen came up asking for language and locale selection. We selected English (India) as our language, and let the other settings be. Then we hit *OK*. A second screen came up, with a big 'Install Now' button amongst other things. We hit that as well. The set-up program thus got initiated, taking another minute to load. What's with Windows and speed?

The first screen showed us a licence agreement. You know what Microsoft EULAs are! Anyway, without accepting it, we could not try it out, so we accepted it with a heavy heart. The next screen threw up a surprise: it was meant to ask us whether to upgrade or perform a new installation. Typical of Microsoft confusion-creating terminology, the new installation option is called 'Custom'. But accompanying it was a common Microsoft Bug—the upgrade option was enabled, and below it was clearly stated, "The Upgrade option is enabled only when you are installing Windows from within an Operating System that can be upgraded to Windows 7."

We hit the *Custom* button. A partition selection screen showed up, where we selected Disk 1 Partition 0 (which means the first partition of the second disk, which GRUB guys will know :-)). It was unformatted (as we had prepared it). We hit *Next*, and whoa, installation had started before we knew it. Installation took a long time, and at the end of it, the thing rebooted the PC



into Windows 7. The first run wizard then asked for a user name, a password, and most annoyingly, a password hint. Now Microsoft is just slashing open a security hole by enforcing that feature. It put the PC through its paces, ran some hardware detection, asked what type of network we were in, and finally took us to the desktop.

Over the entire procedure, the set-up program had installed the Windows Boot Manager onto the first partition superblock and written a new MBR chainloading the first partition, thus effectively destroying GRUB. Windows XP was detected, but no sign of Fedora 10 remained. The entire procedure took 16 minutes plus user interaction time. Way too slow. On the upside, the Windows set-up looks very sleek and superbly streamlined, and it was a pleasure to actually install Windows, save the nasty Fedora busting surprise at the end (but it wasn't supposed to work anyway).

Mandriva was a whole new story. We put the DVD in, and the first thing we knew was that a cool blue 'fishy' menu with some menu items for installing, rescuing, checking our hardware and booting from the first hard disk, had come up. We would have preferred a "Press any key..." prompt to save the overhead of starting the CD boot manager, however. We just hit *Enter*, and after a text-mode phase the GUI installer started up.

The Mandy installer doesn't look anywhere near as sleek as Windows 7's, and at first glance has twice as many steps compared to Windows' set-up. The installer is arranged rather like Windows XP's, with a list of steps stacked in a sidebar at the left of the screen, and wizard dialogs exactly like the WINNT32.EXE installer, only a lot prettier. The first screen is for selecting the system locale, of course. No English (India) here, so we had to settle for English (British). We accepted the licence agreement (which informed us that there was no warranty) and then moved on to partitioning. Partitioning manually was a confusing affair for a new user, compared to Windows 7. Then on, it was smooth sailing.

After selecting the root partition, we were asked if we

wanted to configure additional repositories (for pulling in updated software from the Internet during installation). This was a feature of the Windows set-up since the days of Windows XP (Dynamic Updates), but was absent in the Windows 7 RC set-up. Anyway, we chose not to use these repos but rather pull the packages from our DVD. Then we were asked if we wanted a GNOME desktop or a KDE. We chose KDE, since it is more Windows like (though a bit more advanced), and is visually better. And then, installation started in full swing.

After the package installation was complete (throughout the progress one could choose to see a slideshow of Mandriva's other products or read a text output showing each package's install process), we were taken to the user configuration screen where we were asked for the root (administrator) password, and told to furnish the details of our user account. Here, there was no enforcement to furnish a password hint, and you could use a username other than your full name—two features absent in Windows and two features we really like. We were then asked where we'd like our bootloader to be installed—we chose the MBR of our first hard disk (the one with 320GB)—and then we were taken to the systems configuration screen where we could configure every aspect of the system prior to first boot.

We chose Asia/Calcutta as our time zone and India as our location. There was no need to tweak the bootloader, but we did that just for the sake of giving more descriptive names to the items rather than "linux", "windows1" and "windows2". Both our Windows installations were detected, as well as Fedora Cambridge (which had disappeared after installing Windows 7). Video configuration was interesting, where the system defaulted to "nVidia Cards not working with nv" (we were using the 9400GT; the onboard was disabled in our BIOS—and more on that later). That was all. We went through the next step (which asked us if we wanted to install security updates, to which we said, 'No') and then the PC rebooted, and Mandriva went through a first run wizard, somewhat like Windows XP's 'OOBE' (out of box experience).



Ratings	Windows 7	Mandriva 2009 Spring
Looks	8	5
Speed	16 minutes + user time	11 minutes + user time
Functionality	4	7
Comments	Minimalist and pretty, sacrificing functionality	Rather full blown, with high functionality, sacrificing looks.
Overall	5	6.5

Out of the box experience, and looks: Eye to eye

The out of the box experience on Windows 7 was much better than Mandriva, which is very surprising considering that even Windows Vista with Service Pack 1 lost by a mile. We'll see how.

The first boot on Windows 7 was a big surprise, seeing a full resolution of 1024x768 at 32-bit colour, which is the native resolution of our 15 inch or 38.1 cm flat panel. Even Vista gave only 800x600 at 24-bit colour. Closer inspection revealed that the nVidia GeForce 9400GT was working with full DirectX 11 support. It turns out that Microsoft ships Windows 7 with modified nVidia Forceware drivers that enable support for DirectX11 (the Forceware drivers on nVidia's website are still for DirectX10, but this is slated to change by the time you read this). Our Realtek AC'97 HD Audio worked as well, so did our Conexant CX11252 voice and fax modem (I still have a dial-up connection as a back-up, and I don't use fax, though I can). Windows also recognised our keyboard's multimedia hotkey caps (in previous versions I had to download and install IntelliType, a Microsoft add-on software; looks like Microsoft hates its own hardware), though only partially. The volume keys, playback control, mail and Web keys work; while the zoom slider, My Favourites, My Documents, My Pictures, My Music and Messenger keys don't.

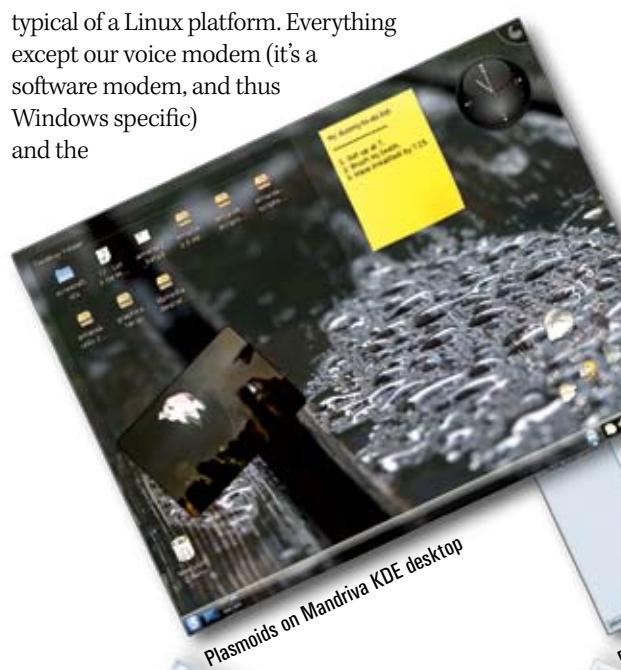
Windows 7 scores a perfect 10 for its looks. Microsoft's taken Vista's Aero to its next level, and added some features. They've removed some as well, like Windows Flip 3D (which I quite liked). One feature I quite like is Aero Shake, where you

just hold a window by the Windows Manager and shake it, and all the other windows minimise, leaving only that one. The sidebar is now gone, and has been replaced by gadgets directly on the desktop, *a la* Konfabulator and KDE4. They call it the Windows Gadget Platform. Aye, refer to the photo gallery on the previous page to find out more.

When you first boot up Mandriva 2009.1, you'll be forgiven for thinking that Mandriva is a visual disaster. The culprit is La Ora, the artwork stack of Mandriva, which makes it look like it's from the last century. We did some handiwork and switched our Mandriva back to KDE4's default look—Oxygen. It probably is a mere coincidence, but Windows 7's and KDE4's desktop look very similar: a transparent, big, iconised toolbar, widgets on the desktop... It's another co-incidence that Mandriva and Windows 7's default wallpapers represent a single fish in water. There are no glass borders on Mandriva, and the text won't look as good as on Windows (as subpixel rendering is patented by Microsoft as part of its ClearType technology). No Aero Shake as well. However, KWin's composting effects (now enabled by default if a good enough GPU is found) cover much more effects than Windows 7. These effects are more soothing than the ones on Windows, but the total effect is lost because of the lack of enough transparencies. And while Windows makes your windows look like glass panels, KDE makes them look like, umm... better.

Another feature was wallpaper slideshows. KDE has it, but it'll cycle over all the wallpapers in your KDE wallpaper registry (or you can add your own 'Pictures' folders there). Over at Windows's stable, there are huge collections of high-resolution images grouped into categories, such as scenes, cartoons, nature, etc. You select one such category, and your wallpapers will cycle over images from it. A category (called a theme) will also change the window border hue (no colour, because it's transparent), and the sounds.

Hardware detection on Mandriva was typical of a Linux platform. Everything except our voice modem (it's a software modem, and thus Windows specific) and the



Plasmoids on Mandriva KDE desktop

multimedia hotkeys on our keyboard was detected. Although our nVidia card was detected, drivers had to be downloaded from the Internet. That's because we're using the 'free' version, which means the DVD has only Free (as in freedom, not beer) software. The nVidia Forceware drivers are not free. But it wasn't at all hard to set it up, however. We could enter Mandriva Control Centre (Mandy's Control Panel) and just start the X configuration tool, and it asked us that since there were proprietary drivers available, would we like to install them? We said, 'Yes,' and after a few downloads and a logout later (no reboot, mind you—Linux doesn't need them), our 9400GT was working like a charm. The Mandriva 2009.1 Spring One Edition comes as a live CD and includes the proprietary drivers as well, so everything works out of the box.

Ratings	Windows 7	Mandriva 2009.1
Looks	10	7 (when we reverted to the default KDE4 look)
Responsiveness	7	8
Speed	6	8
Out of box hardware support	9	9
Overall user experience	8	6

Don't be fooled, however; Mandriva still looks a million times better than Windows XP.

Functionality

This is where all good things about Windows 7 come to an end. Let's see...

Windows 7 takes up an elephantine 6.5 GB space. It dumps everything on the hard drive, and then disables three quarters of all the features waiting for us to enable them. Gazillions of unused drivers lie on our hard drives, taking up space and slowing down the boot process. And at that amount of space consumption, we'd expect some goodies to come along with Windows. We were left shocked.

Apart from Windows Media Centre, Windows Media



Player and Windows Internet Explorer, all the software that we used to get bundled earlier is now gone. No Windows Mail, no Movie Maker, no Meeting Space, no Messenger, no DVD Maker, no Photo Gallery... nothing! We discover that we need another 173 MB download in the form of Windows Live Essentials to get anything at all working. Forget an office suite; you'll have to pay Microsoft close to Rs 17,000 to lay your hands on one. Or settle for a feature stripped one at Rs 5,000. That's still a lot. Simple CD burning can be done with Windows Explorer, but no Authoring (VCDs, Video DVDs and Audio CDs) and no ISO burning. And wait till you hear this: Windows Live still doesn't have a DVD Maker, and its Movie Maker is dysfunctional, at best.

Mandriva is aeons ahead. It includes a complete office suite, with more functionality than MS Office 2003. It's got the best audio player known to mankind, by the name of Amarok. A serious video player is lacking, but SMPlayer can be gotten from the repos. It has Kopete (instant messenger), KDElive (a video editor), Gwenview (a photo viewer), The GIMP (an image composer with the same functionality as Photoshop, even with proper CMYK support) and a whole load of other software. Space consumption? A mere 2.5 GB when first installed.

So how can a 4.34 GB DVD install only 2.5 GB of software? Well, apart from KDE, the DVD holds another completely different set of applications for the GNOME environment. Apart from that, Mandriva can perform as a complete server. It actually has server packages for the Web, mail, database and DNS right on the DVD. Windows 7 does have IIS7, but it's stripped, and none of the additional server software is present. And there's also virtualisation and clustering software, and a full range of development software—from languages to IDEs.

Ratings	Windows: 3	Mandriva: 9
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Resource hogs

Windows 7 is a resource hog. It needs so much for itself that it leaves nothing else for others. With 2 GBs of RAM, we find only 427 MBs free for use.

Just to display the desktop, it's been hogging graphics resources (I can tell from



the temperature of our GPU; in Windows XP it remains cool as anything, in Mandriva even cooler but on Windows 7 I can actually feel the heat radiating). With its new DirectX 11, it's touted as a gamer's OS. If I were to buy Windows 7 for gaming, I'd throw the disk into the sewers without remorse.

Mandriva on the other hand is based on Linux, and Linux has always been a low-requirements kernel. Compare the requirements: Windows 7 needs at least a GB of RAM, a good GPU and a 1GHz processor. Mandriva needs 256 MB of RAM, any old GPU which has worked in the history of UNIX and a 500MHz processor. And don't be fooled by these low requirements; Mandriva certainly offers a good user experience.

And as of now, Windows 7 is downloading more than 700 MBs of updates for itself and Office 2007.

Ratings	Windows: 4.5	Mandriva: 9
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Multimedia capabilities

Both Windows and Mandriva play MP3s and MP4 (XviD) files by default. Both play DVDs as well, and none play FLVs. Mandriva has an edge, however, as codecs for unsupported media formats are automatically downloaded and installed the first time you play one of those formats, whereas in Windows you need to trudge for a third-party solution that breaks the default codecs most of the time.

Ratings	Windows: 8.5	Mandriva: 9
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Bug hunting...

In Mandriva, we could not find a single road-blocking bug. However, Windows was full of them. First, Windows 7 would not recognise any drive volume labels I'd assigned to the disks and showed all of them as "Local Disk". In Contacts, you can create only those contacts that have birthdays in the future. This bug's been there since Vista. Then, in Windows Explorer, if you select multiple files, all the icons overlap together and create a hotchpotch in the preview pane.

...and the big bug

This concerns the Windows update feature in Windows 7. Windows, by default, is set to download and install all security updates automatically without notifications (optional updates are not installed automatically). However, while the updates were being downloaded, we found out that we were unable to browse, or for that matter download e-mails to our mail client or stay online on Pidgin (Windows version). It turned out that the update feature was using up all our bandwidth. To circumvent this problem temporarily, we tried to stop the update download process. In the Windows Update control panel applet, we clicked on 'Stop Downloading', and immediately, the applet informed us that updating had been cancelled. However, we still could not browse, and the Data Traffic indicator on our router was blinking madly. We could only reach one conclusion: Windows was still downloading updates at its full capacity. We got proof of this when we resumed downloading the updates; we had paused at 85 per cent and it had resumed a full 3 per cent ahead—at 88 per cent.

The usability of the Internet from our computer during the update process was so bad that even DNS queries would not resolve. We could partially improve on this situation by switching to the OpenDNS servers, but even then pages as simple as Google's homepage were taking two to three minutes to load, and others were giving up with connection timeouts.

We believe that a combination of factors is to blame. Even though this build of Windows 7 is a release candidate, we cannot rule out a bug that makes the WU Applet say that downloading has been stopped, while in reality it is still happening. On the other hand, the fact that updates take up all of the bandwidth is a serious problem for Indian households, which typically have no more than 256 Kbps of bandwidth for unlimited usage connections. And if they have limited usage connections at higher speeds, they pay more, because Windows 7's updates are huge in size (~700 MBs has been downloaded as of now to our computer) as compared to Mandriva's ~300 MBs. But the biggest flaw we believe is that WU defaults to downloading and installing updates automatically without even notifying the user. Mandriva and most, if not all, major Linux distributions default to informing the user when updates are available, so that the users can download and install them at their own leisure, such as setting them to download overnight before going to sleep.

Judgement day

Well, Mandriva any day! Though Windows 7RC looks good, it does nothing else. And at nearly Rs 13,000 for the Ultimate Version (which has all these visual gimmicks; the lesser versions don't have Aero, don't have Media Centre and don't even look good), you're better off investing that money somewhere else. And with the kind of resource hog Windows 7 is, we'd still recommend Windows XP to any professional gamer, or to people who need some version of Windows at least. For people who can do without Windows, don't go back to Windows 7, and just switch to Linux. And now that Windows XP is off the retail shelves, you'll either have to buy Windows Server 2003, or resort to piracy to obtain Windows XP. But don't, and instead use

Musings

1. Windows does include nVidia Forceware drivers, but it doesn't include the nVidia Control Centre, making it impossible to tune the GPU by hand to deliver maximum performance. A default installation of the Mdv nVidia Forceware-GLX drivers from the repos does include the Control Centre, but it's nowhere near as advanced as the Windows version. But hey, settings are OS-specific, except overclocking.
2. The Mandriva Installer stuttered on the bootloader. It installed six entries, one for itself, one for no-framebuffer, one for failsafe, two for Windows and one for Fedora. The first Windows entry was chained to boot into sda1 and the second to sdb1. The first worked, it booted into the Windows 7 boot manager where I could choose to boot XP or 7. The second one gave an error: BOOTMGR missing. I'm certain this is a Windows problem. The Fedora menu entry didn't work as well, as GRUB faulted with a partition type unrecognised. That was rectified by changing the root entry from (hd0,2) to (hd0,1).
3. Windows 7 has a feature called subsystem for UNIX applications, somewhat like Cygwin. However, upon enabling the feature, all I found was a folder in my start menu with a URL shortcut to SUA's download site. And the download is huge.
4. Mainstream editions of Windows 7 will have a mode called Windows XP mode, which will provide a paravirtualised Windows XP on 7. This will require a CPU with virtualisation extensions.
5. To test an anti-piracy feature, we tested Microsoft Office 2007 with a known non-genuine key found on the Internet. The office-update website detected this non-genuine key and would not let us update. Cut to Windows Update, it downloaded updates for both Windows and Office, including two service packs amounting to well over 300 MB and numerous security patches.
6. On the interoperability front, it seems that MS has done some homework for a change. The stripped-down word processor in the name of Word Pad that comes bundled with the OS does support ODT files, but informs the user straight up: "Word Pad does not support all the features of this document format. Some formatting information of content might be displayed incorrectly."

Linux. And if you need a good version of Linux, use Mandriva. And for people familiar with Linux basics, Fedora is also recommended. 

By: Boudhayan Gupta

Boudhayan is a 14-year old student who suffers from an acute psychological disorder called Distromania. He owes his life to Larry Page and Sergei Brin. Apart from that, he enjoys both reading and writing, and when he is not playing with his Python ;-), during most of his spare time he can be found listening to Fort Minor, or cooking.

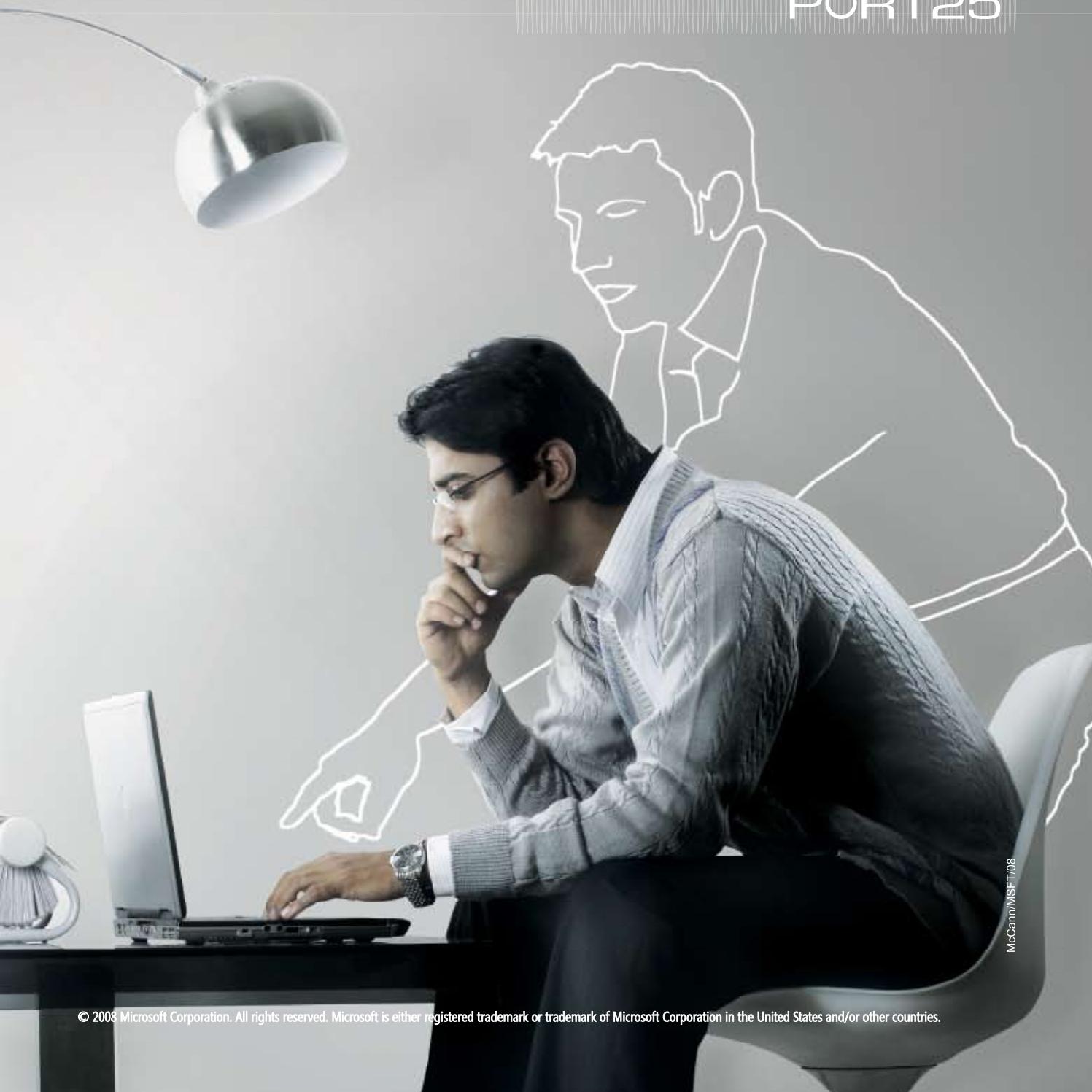
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GYachi is Here

If you are hooked to Yahoo! Messenger because of some of its cool and core features, but also want to keep your hands off Windows, take a look at GYachi.

Ghere are many like me who are addicted to instant messaging, a.k.a. chatting. So it's not surprising to find so many IM tools available for GNU systems—Kopete, Pidgin, Empathy, and so much more. They enable you to log into any of the chat services—GTalk, Yahoo!, AIM, MSN and any others. Some are good, while some are not, although I did feel a bit inferior whenever I saw someone on a Mac or Windows machine using the full version of Yahoo! Messenger. This software allows them not only to chat but also use the Web cam, share photos in a live session, send or receive files, log in to chat rooms and much more.

I have used most of the GNU chat clients, but none gave me the kind of satisfaction I needed. And I am not enough of a geek to write one myself. But I am, just like most of you, someone who has the most power—I am the user. And I am a GNU/Linux user. We are quite good compared to those Mac users for whom a computer is as good as a TV. Just turn it on, use it and shut it down. The policy they follow is called 'DADT'—'don't ask; don't tell'... and how it works! It's not wrong to call the TV the idiot box. I don't

know what a Mac ought to be called, though, but Mac users surely deserve as much right to information and *better* software (not just better *looking* versions). Now, Windows users are poor souls. Neither does the software look good, nor does it work well.

So, as a GNU/Linux user, I took a dive into the World Wide Web and came across an IM client with a name not as long as Arnold's last name, but definitely as difficult to pronounce. It's called GYachi. I had never heard of it before—I guess it's just my curiosity that brought us together.

GYachi [gyachi.sourceforge.net] is actually a fork of the Gyach Enhanced Yahoo! client for GNU/Linux operating systems. The project was forked because the original developer got involved with other activities and there was some worry over the future of the project. Well, that is the rule of the Freedom Software world, unlike the proprietary world—no project stops because of an individual or an organisation's unwillingness to take it further. Do you know what the future of Yahoo! would be like after an acquisition by M\$, for instance? No. But you do put all your bets on any Freedom Software

Features include

- Web cam support
- Voice chat support
- File sending
- Photo sharing
- Mail notification
- Captcha support—Yahoo 8 onwards uses captchas to enter chat rooms in order to control spam bots.

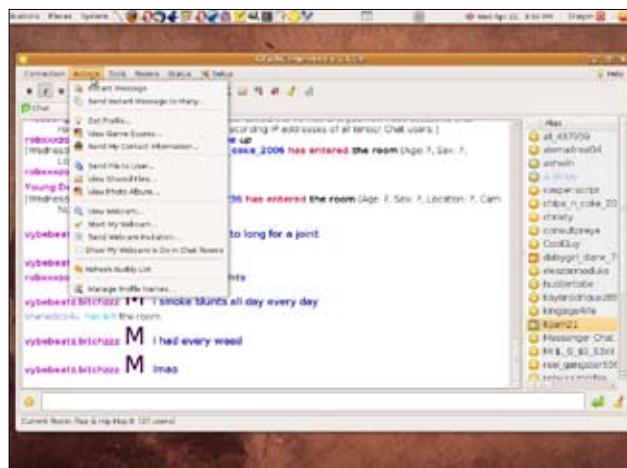


Figure 1: Features

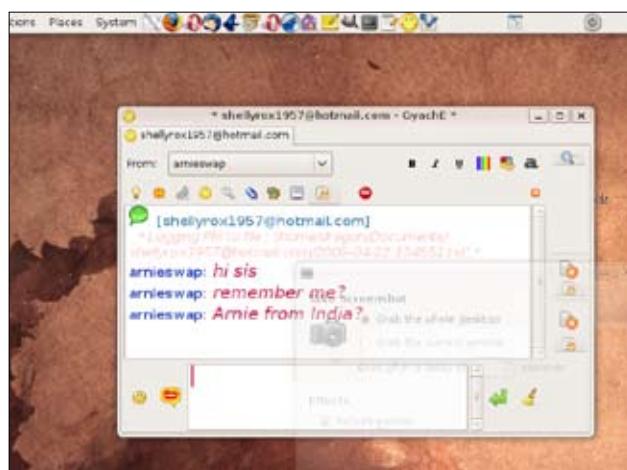


Figure 2: Chat window

because it can always be forked.

Now, enough history and politics. Coming back to GYachI—this IM client offers some cool features that are all missing in Pidgin and Kopete, which most of us use to talk to our Yahoo buddies. I wonder why the Pidgin and Kopete guys shy away from sharing photos... ;-)

F(re)eatures

GYachI attracted me because it enabled me to do almost everything that any Yahoo user can do on a sluggish Windows machine or the too prudish Mac machines. However, since you run it on GNU/Linux systems, no one can send 'malicious' software and corrupt your system.

In the world of GYachi, no one can boot you, or force you to shut down the IM client. This application will automatically term users as booters if they try to mess with you and throw them in the ignore list.

What's more? You can share photos just the way you do on Yahoo! Well, to be honest, it's not the way you do it on Yahoo!, as people often complain there, "Hey I can't see your photo in *Share...*" and you don't even know what's wrong. In GYachi, you can see how many of your photos have been downloaded on your

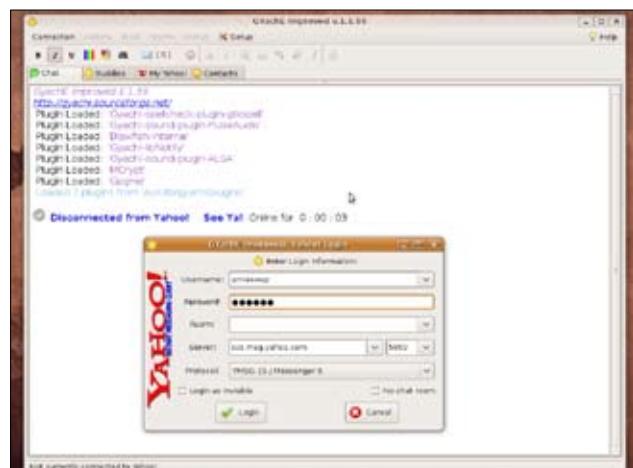


Figure 3: Login screen

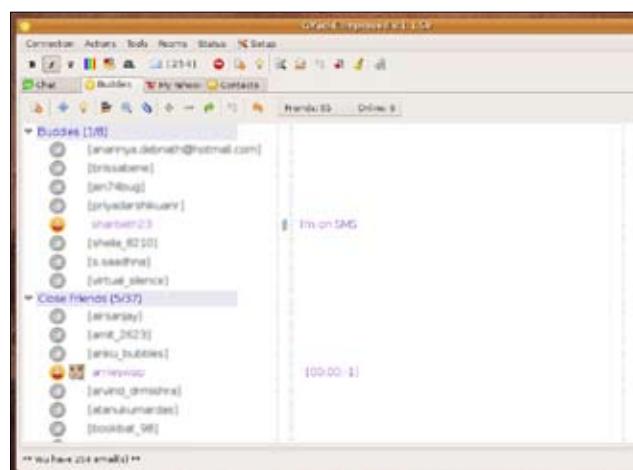


Figure 4: Contact list

friend's machine. You can share files by sending them, you can use video chat if you have a Web cam, and hey, it even lets you record the stream. Hmm, now this *is* something cool.

GYachi is an awesome alternative to YM on GNU/Linux machines, but this project needs some dynamic development—the last major release came out back in November 2007. As users, we can apply the simple rule of development—more users will create more of a buzz to attract the attention of the developers to get back to their jobs ;-) So, give GYachi a try—if it's not available in your distro's software repository, go to tinyurl.com/gyachi to get a DEB or RPM file of your choice. And if you like it, simply do what I did—spread the word. 

By: Swapnil Bhartiya

By Swapnil Brar, [EEFTimes.com](http://www.EEFTimes.com)

A Free Software fund-a-mental-ist and Charles Bukowski fan, Swapnil also writes fiction and tries to find cracks in a proprietary company's 'paper armours'. He is a big movie buff and prefers listening to music at such loud volumes that he's gone partially deaf when it comes to identifying anything positive about proprietary companies. Oh, and he is also the assistant editor of [EEFTimes.com](http://www.EEFTimes.com).



The Magic Cupcake Effect

A new device and an upgraded operating system... is that enough for Android to finally make its presence felt in a highly competitive mobile phone market?

The first phone bearing Google's open source mobile operating system, the HTC G1, might have sold more than a million units, but it did not trigger the open source mobile OS revolution that many had expected. It did get decent reviews but was seen by many as a work in progress with a number of rough edges. Be patient, we were told, this is not the best of Android. Better things are in store.

So it was hardly surprising that many mobile phone lovers were disappointed at the relative absence of devices based on Android at the 2009 Mobile World Congress. That said, the one Android-powered handset that was launched, did grab more than its share of headlines—the HTC Magic. And May saw the device being released in the markets (alas, not in India, although our sources tell us that it will make its way here, unlike the G1), along with a significant update to the original Android operating system. The

update, called Cupcake, took the operating system to 1.5 and added a number of features to the original operating system. But the question running through everyone's minds was: were these enhancements enough to make the new device a mainstream success?

Serving a slice of (cup)cake...

It speaks volumes of just how much Google has changed the mobile operating system game that people have actually become more interested in the OS running on the device than the device itself. The Cupcake update has ironed out a number of the faults of the original Android, although there is no visible change in the interface itself. Perhaps the most spectacular change in the OS is the inclusion of an on-screen keyboard—the first edition had none, forcing users of the G1 to slide out the QWERTY even for the most minor typing task. The new keyboard seems impressive and works in both landscape and portrait

mode. It has a preview area where suggestions of the words you may be attempting to type are displayed, and also comes with haptic feedback, allowing users to feel a slight vibration every time they touch a key—something that the iPhone does not have.

The other significant change is in the browser, which is based on Webkit and has a new Javascript engine. This, by all accounts, facilitates faster browsing. The address bar has also been merged with the search bar (shades of desktop Chrome)—again, a very handy change considering the limited amount of display real estate available to users. There is even a text search option that highlights the words on the page that contain the letters you are keying in, as you type. Still, all said and done, Cupcake is not really in the class of Opera Mobile and Safari. Not yet.

For imaging lovers, there is the addition of the record video feature—nothing earth-shaking really, but something that is so common that its absence in the G1 irked users. Incidentally, another multimedia addition that Cupcake brings is the support for A2DP, which should allow people to use most generic Bluetooth headsets with their Android devices. All this is topped off with the usual bunch of Google goodies, most notably Google Maps with Latitude (allowing users to track where their acquaintances are) and near seamless integration with most of Google's online services such as Calendar. Wonderful if you love Google; not too great if you do not. However, on the mail front, there is still no support for MS Exchange. Meanwhile, though the Google Marketplace is not giving the App Store sleepless nights, it still has more than a fair number of applications that users can download to enhance their Android devices. There is even a



complete office suite (Documents to Go) available for Android handsets!

...with some Magic

The HTC Magic itself is much sleeker and better-looking than the slightly lumpy G1—dropping the QWERTY keypad might annoy texters but it sure does wonders to the device's appearance. Unlike the G1, this is not a phone that people will mind flaunting, the black version being particularly

easy on the eye. With no physical keypad, the Magic is a complete touchscreen device and while Android still does not support multi-touch like the iPhone's OS, the quality of the touchscreen makes using it a pleasant enough experience—definitely better than some of the Windows Mobile devices one has used. Mind you, those who love the minimalist design of the iPhone will be annoyed at the clutch of buttons beneath the display—there are seven buttons in all, making the area a trifle crowded. The trackball that was seen in the G1 has been ditched, but the screen is so responsive that people are not likely to miss it. More annoying is that the phone does not have a standard headphone jack. The headsets plug into the mini USB port, leaving one with no option but to invest in Bluetooth headsets if one wants to listen to music while charging or syncing the device!

In terms of specifications, there are the usual connectivity options including Bluetooth and Wi-Fi. The camera still is 3.2 megapixels and there is no sign of a flash yet, but well, this is not really a multimedia phone. Battery life is believed to have been given a decent boost too, saving one from the need to charge it every day.

Better hardware, better software... all in all, the HTC Magic represents a significant step forward from the G1. But it still does not give one a compelling reason to switch to Android from one's existing smartphone, unless of course one wants that snazzy Google logo on the back of the device. Android has not yet really arrived. But if the HTC Magic is any indication, it does not have too far to go.

END



By: Nimish Dubey

The author is a freelance writer with a passion for IT. He can be reached at nimishdubey@gmail.com



Get Out of Office

...like it's an emergency: before somebody dials 1600-11-0033 toll-free.

Do you know of noble gases? On the extreme right of the periodic table you may find a few of them. But you may find tens of millions more in the real world. These noble gases are totally inert to using OpenOffice.org, the completely *muft* and *mukt* alternative to MS Office. They must indeed be noble to pay what I consider a steep price for using MS Office, which is infinitely more expensive than the zero price of OpenOffice.org. Oh! And wait till you hear all the gas from them about why they have not yet considered or migrated to OpenOffice.org.

Call 1600-11-0033 toll-free

The most popular excuse is also the most obvious: "Even I've got my copy of MS Office free, like everyone else I know, so why should I use OpenOffice.org?"

None of my friends or colleagues have been caught, fined, or sent to jail." You mean no one has yet called the anti-piracy toll-free number in India, 1600-11-0033? Good. Keep waiting. And be nice to that disgruntled employee you just sacked; or that competitor you just cut off from that lucrative deal.

RTI

The next excuse: "Everyone uses MS Office, so my organisation has purchased legal licenses for every desktop and laptop in every department. Why should I use OpenOffice.org?" If you're a government agency or funded by one, how about justifying that in a Right To Information (RTI) request. An RTI can be filed by any citizen concerned about why your department is squandering away so much money on expensive software licenses when a 100 per cent drop-in replacement is available, which is not only free-of-cost, but also has a large precedent of adoption in various ministries and departments across the government of India. More information about India's RTI can be found here: righttoinformation.gov.in

If you're a public-limited company, any shareholder could question you. If you're not answerable to anyone else, then launch Microsoft Excel and calculate how much money you'd save with a complete migration to OpenOffice.org. Hold an office meeting out in the open to discuss how best to use the money saved to survive the meltdown, and grow your business.

"Launch Microsoft Excel and calculate how much money you'd save with a complete migration to OpenOffice.org"

Hall of fame

I just hopped over to the various websites of *LINUX For You* magazine. Let's see... there's linuxforu.com, lfymag.com, and openitis.com. I then checked Venkatesh Hariharan's blog, Prakash Advani's, and of everyone else interested in the adoption of ODF and OpenOffice.org in India. None has a special section yet on the 'OpenOffice.org Hall of Fame'. Maybe evangelists of Free and Open Source Software (FOSS) in India could come together to create such a high-profile website. Or maybe you could just stop reading this article now, and go create it yourself. All this website would do is list government organisations, PSUs, and NGOs, that have successfully adopted OpenOffice.org. A helpful link to each may even link to a more detailed case study. If I were a Linux Users Group (LUG) looking for a *raison d'être*, I'd contribute to a 'Hall of Shame', listing those who stubbornly refuse to adopt.

Okay, I'm convinced

So you want to migrate to OpenOffice.org but don't know how? You can download the free OpenOffice.org from the eponymous website, and install it on your computer. It's really that simple. You can then burn unlimited copies on to CDs and pass them around, or share over USB drives. If you want some training and orientation, check the ads in *LINUX For You* magazine, or a reputable

IT training institute. Do you want commercial support so you can have someone else contractually responsible to handle any hiccups or technical issues? Just ask around for software vendors who can, or write to lfyedit@efyindia.com for pointers.

Out-of-office reply

Are you feeling as frustrated as I am with the apathy of everyone around you using MS Office or any other proprietary office suite software? Do you want to get involved with any of the ideas mentioned here, or do you have more ideas? E-mail me. I'm focused on getting this started. No talk. Just work. 

About the author:

Inspired by the vision of Osho. Copyright February 2009:
Niyam Bhushan. freedomyugs@gmail.com. First published in *LINUX For You* magazine. Verbatim copying, publishing and distribution of this article is encouraged in any language and medium, so long as this copyright notice is preserved. In Hindi, 'muft' means 'free-of-cost', and 'mukt' means 'with freedom.'

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Launching Apps at Quicksilver Speed

One of the most popular open source applications on the Mac platform is Quicksilver, an application launcher that remains a firm favourite among many users, notwithstanding a similar inbuilt feature in the Mac OS. We take a closer look at what makes it so special.

Mac users generally are extremely fanatical about their operating systems. In fact, many will point out that one of the reasons they switched to a Mac was because they liked the different interface and that the Mac OS manages to do so much more than its counterparts, and much faster at that. Of course, the Mac OS vs other open OSs argument is a perennial one, and not one that we propose to enter into now.

But even the Mac's perceived superiority has not stopped Mac users from using FOSS applications from time to time. And this is not only when the open source application provides functionality that is not inherent in the Mac OS (such as OpenOffice.org). Quicksilver is one such application that, in spite of having a counterpart in the Mac OS itself, is still popular among Mac users. So popular that it has inspired clones on other platforms—most famously, GNOME-Do on Linux.

Ready, set, launch!

In the simplest terms, Quicksilver is a launcher. It primarily helps users find and launch applications and access information and files on their systems. Of course, there is more, as we will find out. But first things first—getting Quicksilver is easy;

you can download the latest version of the application from getqs.blacktree.com. At less than 2 MB, it won't take much time and will install smoothly. Incidentally, Quicksilver is available for versions of the Mac OS going back to OS 10.3 (Panther), allowing those who have stayed with older versions (the latest is 10.5—Leopard) to use the application too, in the best FOSS tradition. Once installed, Quicksilver can be set to start at boot-up and can be invoked by a shortcut key combination (the default is space+control).

On launching, Quicksilver takes a bit of time (about the only occasion it does so) to create a catalogue of the applications and folders used most frequently by the user. Using it is extremely easy—just launch it and enter the name of the application, file or folder that you are looking for and even before you finish typing, Quicksilver will probably have thrown up the option that you are looking for. We can already hear some Mac users snigger, pointing out that the Mac OS' excellent search tool, Spotlight, does exactly the same thing. What makes Quicksilver special, however, is that it allows you to not just open the application, file or folder that you have found but also execute a whole series of commands involving it.

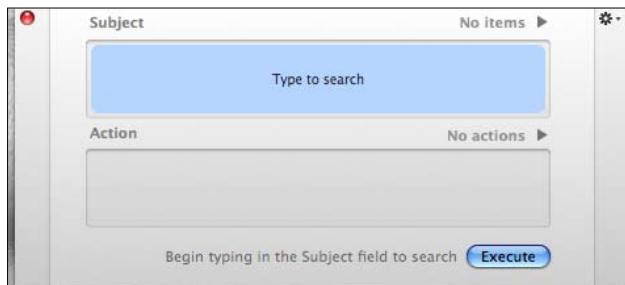


Figure 1: To search for an application or file in Quicksilver, just type in the Subject box

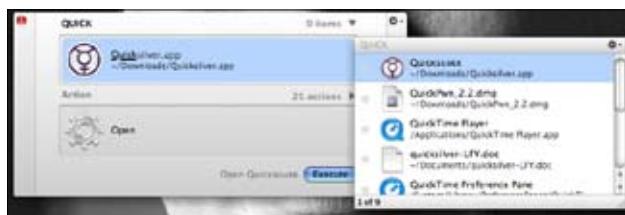


Figure 2: Quicksilver starts throwing up options that tally with your search even before you finish typing

A commanding performance

A simple example will suffice. Suppose I were searching my Mac for my photographs. I would then open Quicksilver, search for Nimish and then, from the options displayed, would pick the photograph (yes, you can tweak the settings to show you a preview) and click on it to open it. But that's only part of Quicksilver's magic. What if I had actually wanted to copy or delete a particular photograph or to just rename it or move it to another folder? Well, using Quicksilver I can do exactly that and much more, without having to open the photograph. All I need to do is select it from the options shown and then choose from one of the many actions that Quicksilver offers. I can even choose to open a file with a particular program, if need be. Another advantage that Quicksilver has is that it keeps track of the applications and folders you use and when you are doing a search, shows the most used options right up front—very handy indeed.

What's also staggering is the speed at which Quicksilver performs. Although it does not do a system wide launch like Spotlight does, it more often than not delivers the result you want literally in the blink of an eye. Spotlight supporters will point out that their tool is much better for looking for an item whose name you might have forgotten, but if you know what you are looking for, Quicksilver seems a much better option, especially because it is likely to show you what you are looking for by the time you have finished typing the first letter! What's more, you can even add functionalities to it, such as the option to send instant messages, dial phone numbers, search for terms in a dictionary and so on—all without compromising on speed.

And as if that were not enough, you can add a number of functionalities to Quicksilver by downloading a number of plug-ins. These enable you to accomplish a number of

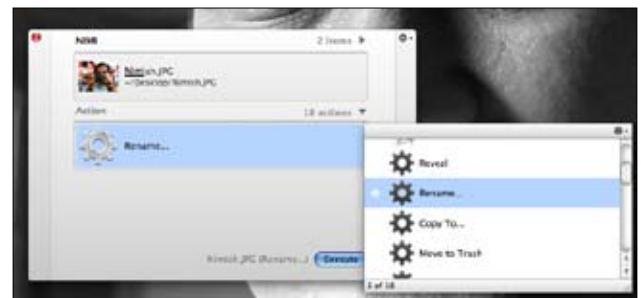


Figure 3: You can not only access a file, but can even carry out a number of actions such as renaming, deleting or copying it

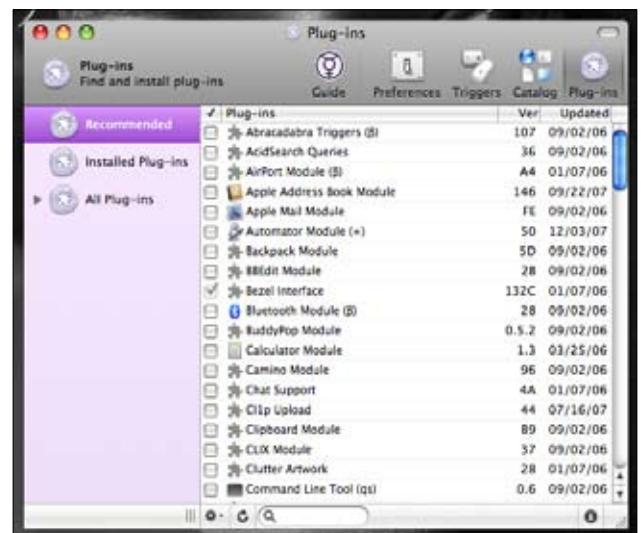


Figure 4: A number of functions can be added to Quicksilver using its extensive library of plug-ins, accessible from within the application itself

tasks without opening specific applications—for instance, you can use the Apple Mail module or the GMail module to send mails and even play around with folders without having to open Apple Mail or go to the GMail website. You can also resize and tweak images, and assign ratings to your iTunes library by using the requisite plug-ins. And you do not have to go about searching for plug-ins for Quicksilver—you can access them from within the application itself by choosing the 'Plug-ins' option.

Yes, it does have its shortcomings. Its searches are not as comprehensive as Spotlight and you have to type what you are looking for really fast—a single pause is considered as the end of the search and the application starts treating every letter you type after that pause as part of a new search. But its phenomenal turn of speed and the fact that it allows you to execute commands with minimum fuss makes Quicksilver a big hit among Mac fans, even after Apple boosted Spotlight considerably. Definitely worth a download if you happen to be using a Mac. 

By: Nimish Dubey

The author is a freelance writer with a passion for IT. He can be reached at nimishdubey@gmail.com



Oracle's Prophecy: Dodge This!

Oracle: "Sorry, kid. You got the gift, but it looks like you're waiting for something."

Oracle has almost acquired Sun Microsystems. By the end of this summer, the details of the deal will be out. Post acquisition, Oracle will become the world's biggest open source company. This could mean hard times for one of the most conservative and 'anti-competition' companies, Microsoft.

Microsoft dominates the market owing to business practices that allegedly kill competition. Microsoft's early penetration into the market is the key to its dominance. Microsoft was never much of an innovative company. It's a myth that Microsoft's focus is the desktop. It's simply a lack of competition at the desktop that ensures Microsoft's dominance in that space. Innovations and Microsoft—the two simply don't seem to gel. Ever heard of anything innovative from those at Redmond other than IE and WMP-- a bloated Windows Vista or W7 barely qualify as 'new'. Look at competitors GNU/Linux and Apple, and you will know what I mean.

The Windows-Office combo seems to be the only door MS has open for corporate users. But once Oracle takes over Sun, some radical decisions by the new giant may bring a balance into the market. In this hypothesis we will explore these frontiers.

Welcome to the real world

Microsoft has only Windows. Oracle now has GNU/Linux as well as the Solaris operating systems. Oracle may change the licence of Solaris to make it compatible with Linux and then share features to make both operating systems richer. Oracle will then push forward Linux in the enterprise segment as the default operating system, using its influence over the loyal database customers.

The enhanced Linux will benefit home users as well. While Microsoft has only ageing XP or now a bloated W7 (read the 'Fight Club' article on Page 21) environment, Linux has GNOME for companies and home users, KDE for high-end users and XFCE/LXDE for old machines. Linux has OpenOffice.org and Koffice; Microsoft only has a controversial Office 2007. The suite of applications that Linux has surpasses Microsoft by light years—just peep into the repository of Debian, which has more than 25,000 different software.

Since Linux will now have the backing of Oracle, Microsoft will think thrice before making allegations of patent infringement to scare off customers. So, that could be an end to Microsoft's FUD tactics, and users will increasingly adopt Linux.

My SQL: Free your mind

Oracle may bring back the key MySQL developers, or work closely with them, to get the development back on track (which had earlier got hit under Sun). There already are two licences for MySQL—this will help Oracle. It will keep the FOSS version at par with the commercial version, or could even adopt Red Hat's model of subscription. This way, big enterprise will replace Microsoft's SQL with MySQL owing to the two biggest benefits—its open nature and support by a trusted corporation like Oracle. If customers want high scalability and are looking for Oracle DB, the transition would be smooth, so there will be market confidence regarding the adoption of MySQL instead of Microsoft solutions.

OpenOffice.org: Good bye, Mr Anderson

This is one market where Microsoft dominates and dictates terms. Recently there were reports that its MS Office SP2 has serious issues regarding interoperability with ODF. This could have been done to scare away people from using ODF and stay with OOXML. Oracle may integrate OOo with its communication suite, pump money into its development and enhance features. It will then push OOo to its corporate customers and dent Microsoft's market share. End users will get a much more polished product with the stable backing of a giant.

Home users: You've been living in a dream world, Neo

Once Oracle sees improved business through these products, it will do something it never did before—target home users. The same products—GNU/Linux and OpenOffice.org—will be available for home users, and Oracle will drive companies like Adobe and the rest to offer binaries for the Linux platform as well. Then graphic designers will have products like CS5 running on top of Linux. Oracle will carpet the world with Linux.

Hardware: Never send a human to do a machine's job

Larry Ellison has already said that he is going to keep Sun's hardware unit. This may initially scare partners like HP and Dell, and push them towards Microsoft. But starting a war against other hardware vendors will make no business sense for Oracle. It will continue to reap benefits from Sun's hardware install base, and continue the development of new hardware to offer its solutions in an optimised manner. At the same time, it will work with vendors like HP to optimise on their hardware as well. Oracle will keep hardware only as an additional unit to continue to earn from the installed market, but will never push it for new customers. It will offer a choice between its own hardware and that from its competitors, as long as they use Linux as well as their database.

Microsoft doesn't have a nut in the hardware segment, let alone a whole box, so the company will not be able to dictate terms and exploit penetration. [I am not talking about a mouse, keyboard and XBox. I am talking about serious products.]

My way... or the highway

All this means one thing: Microsoft may realise that the market can no more be controlled only on the basis of dominance. What Microsoft is facing in the online business will be repeated in the desktop and enterprise segments. The company will be forced to accept the terms of a free market economy. Going forward, the only thing that would ensure the future of Microsoft will be true innovation and fair business practices.

This is something Microsoft is not very good at, but I never said they couldn't improve.



By: Swapnil Bhartiya

A Free Software fund-a-mental-ist and Charles Bukowski fan, Swapnil also writes fiction and tries to find cracks in a proprietary company's 'paper armours'. He is a big movie buff and prefers listening to music at such loud volumes that he's gone partially deaf when it comes to identifying anything positive about proprietary companies. Oh, and he is also the assistant editor of *EFYTimes.com*.



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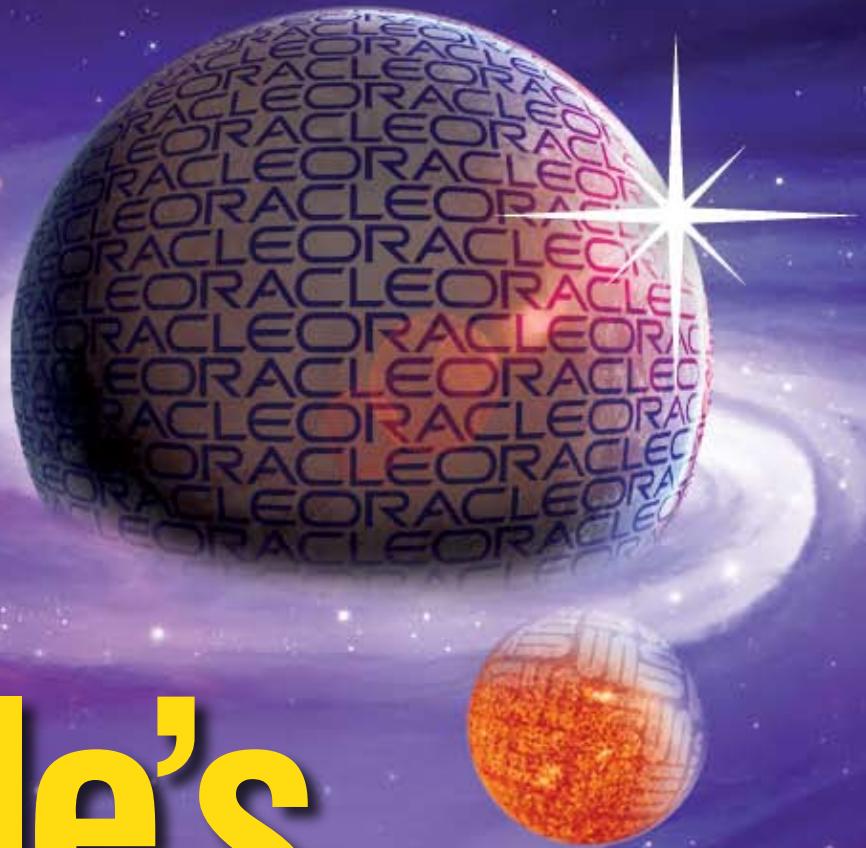
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Oracle's Gravity Pulls in Sun



Oracle is in the process of acquiring another tech giant—Sun Microsystems. This merger will create an entity that will be much bigger and will probably ensure more fair competition in an industry hitherto dominated by either Microsoft or IBM. Oracle will also become the world's biggest open source company. This could make it most suitable for customers, as it will now have a stake in almost every possible field of the tech industry. The deal is sure to force all the major players to re-work their strategies. From the developer's point of view, since Oracle will now own a lot of premium Free Software products, what will happen to core technologies like OOo, MySQL, OpenSolaris and many others? Will Oracle's new solutions stack dent the Microsoft office suite fortress? Will Oracle's hardware partners like Dell and HP become competitors and align with Microsoft? This Oracle-Sun deal is like a galactic collision that promises to shake up the global tech industry.

Read on for the expert opinions on this mega acquisition, and the various scenarios that could emerge from it in the near future.

A little more than a year ago, when Sun acquired MySQL for US\$1 billion, no one would have thought that one of the biggest and the most innovative companies would itself be bought out within a year. Things did not build up in just those 12 months. Sun had not been doing too well since the dotcom burst. The company kept operating due to its deep pockets, which were being drained steadily due to recurring losses. But then came a time when this could not continue. The company started looking for suitors.

"I have known for quite some time that Sun's position was unsustainable and untenable. Somebody was going to buy them. The fact that none of the companies I could imagine buying Sun would find Sun a particularly good fit, did not trump the fact that Sun's shrinking revenues and relevance meant that the sooner they sold out the better. When the deal was announced, the acquiring company might have been a surprise, but the fact of the acquisition was inevitable," says Michael Tiemann, co-founder of Cygnus Solutions, a company founded in 1989 to provide commercial support for free software that was later merged with Red Hat in 1999.

"Oracle as the acquirer was unexpected though. There were a lot of different feelings about the acquisition. Overall it did not thrill anybody. It was a cold calculating move from Oracle that did not add much to the industry as a whole. If IBM had been the acquirer, people would have been less surprised, but an IBM acquisition would not have been exciting news too," notes Laurent Lachal, director, open source research, Ovum, a software and IT services consulting firm.

But how different would it have been had IBM acquired Sun? "IBM has a systems and services culture that is a better fit for selling systems, while Oracle is strictly a software culture based strongly on the sale of software licences and maintenance services. I would personally be surprised if Oracle keeps the Sun hardware business," says Tony Wasserman, director, software

management program, Carnegie Mellon University. Tiemann echoes this sentiment, "It is impossible to say for sure [what would have happened if IBM instead of Oracle had acquired Sun], but I think that IBM has demonstrated a number of strengths where Sun was weak, and vice versa. So it would have been a more logical and complementary marriage."

"From the Linux Foundation's view, either Oracle or IBM represented positive outcomes for Linux. Both these companies have robust pan-organisational Linux initiatives," noted Jim Zemlin, executive director, Linux Foundation.

Since the IBM-Sun deal did not materialise, this is now an irrelevant point. Oracle has changed the game, and now, there is an equally-matched heavyweight that can compete with IBM in almost all the market segments where the Big Blue dominates. Well, competition and choice are ultimately beneficial from the viewpoint of the customer, who's more interested in the free market dynamics.

On the other hand, HP may be a bit worried, as it will now have to deal with Oracle as a partner for database businesses, as well as a competitor in the hardware and operating system space.

The hardware game

The core factor of this deal is: while Oracle is a software company, Sun was primarily a hardware company. Hardware is a low-margin business, whereas Oracle's turf till now has only been the fat-margin software business. There are speculations that Oracle will sell off Sun's hardware business, which will accomplish two things for Oracle: end the worries of its OEM partners, and get rid of the investment-hungry and R&D-intensive hardware business. But Sun's balance sheets show that it was the hardware business that was making money for the company. In the first quarter of 2009, Sun reported an 83 per cent year-on-year billings growth in its Solaris-based units. Sun reported a 12 per cent year-over-year revenue growth in the emerging markets region,



“From the Linux Foundation’s view, either Oracle or IBM represented positive outcomes for Linux. Both these companies have robust pan-organisational Linux initiatives.”

—Jim Zemlin, executive director, *The Linux Foundation*

with India, Latin America, a combined Russia, Middle East and Africa growing by double digits, year-on-year.

Now, who would want to let go of such a profitable business? Certainly not Larry Ellison. The Oracle chief recently ended the speculation of a sell-off. He was quoted in a Reuters interview as saying, “We are definitely not going to exit the hardware business. If a company designs both hardware and software, it can build much better systems than if they only design the software. That’s why Apple’s iPhone is so much better than Microsoft phones. We think designing our own chips is very, very important. Even Apple is designing its own chips these days.” [Guess he can’t resist having a dig at his favourite rival, Microsoft.]

But Oracle has no prior experience in hardware except for Network Computers (NC), which could be called a failure. “Fortunately for them, NC was so small an effort that writing it off cost them almost nothing. Sun was very much a hardware company, and it’s a surprise to see Oracle wanting to make

such a bold move,” says Tiemann of Cygnus Solutions.

But sticking with the hardware business would mean walking a tight rope. HP, Dell and IBM may be wary of the situation. Well, Oracle might be happy to cause some worry to IBM, which has always been a competitor with an extra edge. Ownership of Java was one of the reasons Oracle acquired Sun, as Ellison claimed. IBM’s stack uses a lot of Java, and Oracle just can’t let it go to IBM so easily. It seems like Ellison made the right move at the right time.

Only time will tell what strategy Oracle will adopt in terms of the hardware business—I’m sure it would not want HP, Dell and the rest to go and smoke in Microsoft’s camp. The fact is that today’s customers are smart. They know what serves their interests in the long term. Customers will now see more value in going to Oracle, which will force others to chalk out their strategy very carefully. But, nothing can be said unless the final details of the deal are out. I guess the whole industry is awaiting that moment.

All eggs in the same basket

Apart from hardware, a lot of equations are going to be recalculated in the field of software. One of the most interesting facts is that Oracle now owns one of the most popular operating systems its databases were running on—Sun Solaris. But at the same time, it also has its own Oracle Enterprise Linux (OEL), which the database giant proudly admits is virtually a copy of Red Hat Enterprise Linux (RHEL), minus the RH trademark.

How will the two competing operating systems live and grow within the same company? What kind of commitment does Oracle have towards Linux (besides its own offering, OEL) and it being the preferred OS to run its database?

The fact is that Oracle is one of the biggest customers of GNU/Linux, as well as one of the biggest contributors to the development of the Linux kernel and other GNU tools. According to Zemlin, “... they are one of the largest consumers of Linux in the world in their data centres; this is a company that is very pro-Linux. Purchasing one of Linux’s competitors (Solaris) certainly bodes well for Linux.”

Sun’s demise = failure of the open source model?

There is a feeling that Sun’s demise also means the failure of the open source model. But this is not correct. Sun failed due to the problems it inherited.

Laurent Lachal, director, open source research, Ovum, notes, “Oracle is better positioned to make money out of this business than Sun was. Sun did not make much of its open source software because it never managed to make much of its software business—irrespective of the software being open source or not. If you want examples of open source successes look no further than the insolent financial health of Red Hat whose market capitalisation overtook that of Sun in early 2009.

Sun’s acquisition is not the result of the inability of open source to make money but of Sun to succeed.”

Tony Wasserman of the Carnegie Mellon University adds, “It’s hard to make money in any business these days, let alone a profitable software business. The same is true for an open source business. There are a small number of companies that have built successful open source businesses—most of them combine their open source offerings with other sources of revenues, including SaaS and commercial add-on products. But Red Hat proves that it is possible to build a successful open source business.”

Oracle may be the best friend open source and Linux will ever have. Shane Owenby, director, Linux & Open Source, Asia Pacific, Oracle, earlier told us in an interview, "Our developers internally develop on Linux, so there's quite a lot of momentum there. There is something called 'Oracle on Demand', where Oracle runs an Oracle customer's Oracle software for them—we run that on Linux. So, we trust Linux that much."

Greg Kroah-Hartman, the current Linux kernel maintainer for the stable branch, admits, "They have contributed a lot. See the articles about Linux kernel development on LWN.net for every kernel release, for the details on exactly how many contributions they have made, and where they are."

But will the acquisition of Solaris affect the development of Linux? Chris Mason, a developer from Oracle's Linux kernel team and the primary author of Btrfs (the filesystem poised to replace ext3 as the preferred filesystem on Linux), notes, "Oracle has been heavily using and contributing to Linux for a long time, and all of our public statements around Sun have talked about how Linux is still important to us. In terms of projects done by people on my Linux Kernel team, we don't expect

any decrease in our contributions."

"I expect Oracle's work on Btrfs to remain unchanged. The work the Oracle kernel team does is top-notch and is likely to expand," Zemlin hopes.

There is another possibility. Since Oracle now owns Solaris it can change its licence to make it compatible with Linux, allowing code to be shared between the two projects. This way it will be able to port missing features of one operating system to another which, in turn, will eventually improve both the products. Zemlin's statement seems to echo this, "We would love to see Solaris under a GPLv2 licence... This would be a win for users of both platforms." [The open source Solaris project, OpenSolaris, is licensed under CDDL, a licence which is incompatible with the GPLv2 licence that Linux uses.]

Whether Oracle relicenses Solaris or not, either way it's a win-win for Oracle, at least. There seems to be no valid reason for Oracle to decrease its contribution to Linux, which has become very powerful and popular in the server segment.

So, what now remains unanswered is the future of the core open source technologies that Sun had developed or acquired over time. Some of the

technologies seem to compete with Oracle's line of products. Will Oracle sell them off, kill them or polish them to enter the markets it is absent in?

"We would be happy to cooperate very closely with Oracle but we are not likely to join. After working for a big company like Sun, we enjoy the extra freedom and benefits we get in a smaller company. Another thing is that I don't think Oracle can match the benefits of the hacking business model we have been using."

—Monty Widenius, co-founder, MySQL

"Oracle has a strong business interest in supporting Linux"

...according to Jim Zemlin, executive director, The Linux Foundation.

Q. What is the general sentiment within the Linux community post this acquisition?

Jim Zemlin: Generally positive, but let's wait and see. The deal still needs to be finalised and there are many questions about what will become of the many important open source projects like OpenOffice.org and others.

Q. Are you in touch with Oracle or Ellison to discuss the future of Linux and Solaris?

JZ: I work closely with Ellison's staff, particularly with Wim Coekaerts, who's Oracle's vice president of Linux engineering, and also a member of the Linux Foundation board of directors.

Q. Oracle and Microsoft are both proprietary companies. How much honesty or genuine effort do you see from each side in terms of supporting Linux?

JZ: Oracle has a strong business interest in supporting Linux. It is run on Linux, it offers Linux products and services, and its primary development platform is Linux. Regardless of whether or not Oracle offers proprietary software, it has a strategic interest in supporting Linux. Microsoft, alternatively, has little business interest in supporting a competitive platform that it does not use at all. It does have an interest in promoting interoperability between Linux and Microsoft products in order to respond to customer demands. The company is doing this in Sam Ramji's group at Microsoft, and we often collaborate with them on various issues that are beneficial to both parties.



The day after tomorrow for MySQL

MySQL is one product that almost everyone is talking about because it seems to compete with Oracle's database business. MySQL is arguably the most widely-used database for Web development and Web apps, and therefore has kept a sizable chunk of the market away from Oracle. This means, the acquisition could either spell the slow death of the open source database or fill its lungs with fresh air.

No doubt it's been anything but a bed of roses for MySQL after being

earlier acquired by Sun. Most of the key developers, including MySQL founders David Axmark and Michael "Monty" Widenius, left. Tiemann has the same view, "A year after Sun's acquisition of MySQL, the founders, CEO, and several lead developers had all left without any good things to say about Sun. To me, this hurt the otherwise stellar brand of MySQL. Fortunately, the open source community has many fine open source database projects, and whatever damage may have been done to the MySQL brand, an equal amount of good came to the other projects. Thus, there was no

net loss to the open source community, though there was a competitive shift among the various projects."

Monty came out with a new project and is currently working on Maria DB. However, he has no doubt about the quality of MySQL, and even has a few words of praise for Sun. He also says that Maria DB is less of a fork and more of a branch. He says that the core competency of MySQL is "...the people [behind it]! Sun has excellent support, sales and training people in the MySQL area. In the development part, they used to have excellent developers but a large

'Sun's failure is not the

...according to Michael Tiemann. Well, Tiemann is currently the president of the Open Source Initiative. However, his comments in this story and the following interview are his own opinion and does not represent that of the OSI's.

Q What is the general sentiment within the open source community post this acquisition?

I cannot speak for the whole community, but I offer the following thoughts:

1. A year after Sun's acquisition of MySQL, the founders, CEO, and several lead developers had all left without any good things to say about Sun. To me, this hurt the otherwise stellar brand of MySQL. Fortunately, the open source community has many fine open source database projects, and whatever damage may have been done to the MySQL brand, an equal amount of good came to the other projects. Thus, there was no net loss to the open source community, though there was a competitive shift among the various projects.
2. Sun's ambivalence in bringing Solaris and Java put Sun in a position of constantly explaining and apologising, rather than leading and innovating. Whatever advantages Solaris may have offered compared with Linux back in 2000 or 2001, today the Linux community is where the action is, not OpenSolaris. As for Java, Sun's attempt to 'protect' Java by keeping it proprietary has given a lot of ground to Microsoft, which really knows how to play the proprietary game. Had Sun been more willing to embrace open source principles earlier with Java, the whole competitive landscape might have been different.
3. Given that Sun itself made so many mis-steps with respect to its own open source execution, Oracle has its work cut out. Somehow, it has to do better than Sun with Sun's own assets, and this means both on the community side (where Sun failed) and on the

commercial side (where Sun was failing). Anything is possible, but some things are very difficult.

Q There are concerns about the future of some of the critical open source technologies now owned by Oracle. What do you see as the future of OpenOffice.org, Java, MySQL and OpenSolaris?

The great thing about open source is that the software can succeed and survive independent of any particular vendor. I believe that those projects with strong community support will continue to thrive. As for others that depended tremendously on Sun's own resources, it will be up to Oracle to continue that or not. And on the third hand, perhaps the community will decide independently to suddenly take interest in a project that it had previously ignored, if only because it now sees an opportunity to ride that project to successful independence.

Q Oracle is a hard-core enterprise-only, profit-driven company. Where does open source fit in its strategy?

By my estimation (see <http://opensource.org/node/384> and <http://tiny.cc/mt>), the proprietary software model is destroying US\$1 trillion of capital investment every year, because so many applications are abandoned before ever reaching production, and those that do make it to production are often so late, so broken, or both, that as much as 20 per cent of most other projects must also be written down. By contrast, I believe that open source is the best strategy for the enterprise. So in that case, I believe that open source

portion have now left or are about to leave. Sun has also a great website with a lot of information about MySQL, and is the main source for the MySQL source code and binaries."

This sort of praise for Sun is surprising, coming from someone who once wrote on his blog, "The main reason for leaving was that I am not satisfied with the way the MySQL server has been developed... In particular, I would have liked to see the server development moved to a true open development environment that would encourage outside participation and

without any need of differentiation on the source code. Sun has been considering opening up the server development, but the pace has been too slow."

But things have changed now, or rather those at the helm have changed. MySQL now belongs to a company that is the world's largest database vendor. Will things change for the good? "Not really," believes Axmark, "Since the suffering was mostly from being integrated in a big company. And this means another integration."

Another factor that will decide the

fate of the popular open source database is what MySQL means to Oracle—is it perceived as a threat or a benefit? Axmark thinks that MySQL is both a threat as well as a benefit. "But mostly a complement, since Oracle is not that big in the online/Web market. Oracle is aimed at OLTP [online transaction processing], and MySQL at Web-related stuff."

Monty agrees, "MySQL is more suitable for Web developers or for applications where the demands change rapidly. It's also more suitable for new applications where you want to quickly

failure of Open Source'

fits perfectly into the future of any company that wants to derive profit from technology investments!

Q Microsoft is Oracle's favourite rival. But Oracle now has more teeth. Operating systems, hardware, middleware, a complete range of databases, and the strongest MS Office contender—OpenOffice.org suite. Do you think Oracle will try to polish some of these apps to upset Microsoft Windows' market share among corporate users?

I see many possibilities, but I also think that Sun is a complex company. Acquisitions are complex, and I don't expect that Oracle is going to rush a strategy that it has one chance to execute correctly.

Q There is a school of thought that suggests that the failure of Sun and its buy-out by Oracle is a message that open source is not a profitable business model. What do you say?

I would say that Sun's failure is not the failure of open source, but more Sun's failure to work with open source properly. If you want to look at the profitability of the model, look at the company that's doing open source the best.

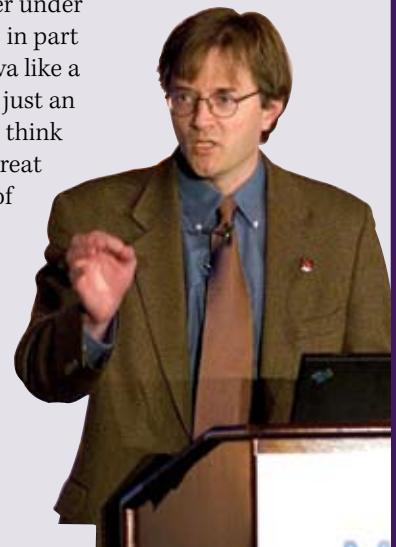
Q Oracle has been working with the Linux community, but is otherwise not seen as embracing the term 'open source'. How would the development of Sun's OSS products take place under a proprietary environment?

I do not believe in 'proprietary open source'. I also think that the many attempts to create hybrid open source models are doomed to fail. I believe that Sun's failure proved that, and I remember when people used to think that Sun was too big to fail. I believe that if Oracle attempts a hybrid

open source (or a 'proprietary open source model'), it will add its name to the list of companies who have failed by doing it wrong.

Q Do you think the open source teams from Sun will face a culture shock at Oracle, as the open source working environment seems to be missing at Oracle? The teams at Oracle may be more comfortable with Linux but not with Open Source?

Oracle has been contributing to the Linux kernel for quite some time, and they get no special treatment, good or bad, from that community. If you are talking about Sun's engineering teams now reporting to Oracle managers, I'm sure that differences in management/leadership style will be a shock for some and not for others. If anything, I would expect Java to fare a little better under Oracle than under Sun, in part because Sun treated Java like a child, and to Oracle it's just an asset. As I said earlier, I think that Open Source is a great way to grow the value of a technology asset, so perhaps Oracle will be more successful with a true open source strategy for Java than Sun—which for most of Java's lifetime, tried to make it look like it was open/open source.



MySQL-Oracle comparison chart

Benefits of MySQL:

- Price
- Open source (no lock-in)
- More than one development entity (also at askmonty.org, ourdelta, etc)
- Much easier to deploy
- Bigger employment base, well known
- Easy to set up replication
- De-facto standard in the Internet world
- Pluggable storage engines, which makes MySQL suitable for a wide range of applications that would not be possible with a conventional design.

Benefits of Oracle:

- More complete database (a lot of features)
- Scales better on large systems
- Trusted by the big enterprise users who still have doubts about open source.

—courtesy Monty

get things going without having to pay a lot (of time or money) to get the database running.”

All this is from the point of view of the MySQL founders. No one really knows what those at Oracle are thinking. There's been no word about MySQL's future in Oracle's statements. There are several possibilities, which may determine what Oracle could do with MySQL [see the side box on this page].

If Oracle does put MySQL in the 'benefit' category, it's good news. Oracle is a profit-driven, high-speed train, and can achieve what Sun couldn't—monetise MySQL. This will happen only if the company sees some benefit from MySQL. Given the installation base MySQL has, there is no doubt Oracle will get access to that market. Also, it will now have the entire developer base working around MySQL. Monty points out the benefits Oracle will get by merely owning the MySQL brand: “Owning the trademark of the most used open source client server database gives a lot of value. Oracle can use the MySQL website to spread their message.”

But will the core developers return to their much loved project and join Oracle? “We would be happy to cooperate very closely with Oracle but we are not likely to join. After working for a big company like Sun, we enjoy the extra freedom and benefits we get in a smaller company.”

What will Oracle do with MySQL?

There are several possibilities around what Oracle can do with MySQL. Let's see what the MySQL founders think of these possibilities. Both Axmark and Monty have shared their opinions about the possible scenarios:

(a) Kill it by stopping development or slowing it down, thus rendering it useless.

Axmark: Meaningless, since there already are a few full/partial forks out there.

Monty: The reason for doing this is to stop MySQL from cannibalising on Oracle business.

(b) Keep an inferior version open but make a polished version paid and closed.

Axmark: I doubt that would really work [make money] in my view.

Monty: The reason for this might be the same as I'd suggested for (a) but they may try to commercialise our current users to get some money back from their investment. This would cause even more people to want to fork MySQL.

(c) Boost development, fix issues and create an excellent product to compete in the domain.

Axmark: I could see them making MySQL work very, very well on Windows to compete with Microsoft's database products. And still work well on Linux, but not aim so much for high-end transaction loads.

Monty: The reason for doing this would be to use MySQL to hurt the other commercial databases and gain market cap.

(d) Sell it off.

Axmark: Probably not... since the ones who would pay well would directly compete with Oracle.

Monty: This could happen because they bought Sun for reasons other than MySQL and they don't find MySQL important; or if they have to do this because of US anti-trust laws.

Monty's fifth possibility: I would prefer to see an (e) happen where Oracle would promise to keep MySQL always free—and to ensure this freedom it would establish an independent entity to develop MySQL source code and work with the community.

Another thing is that I don't think Oracle can match the benefits of the hacking business model we have been using. The main problem is that the critical people needed to drive the MySQL project may not be staying around to give Oracle a chance to improve. I see it as my main job to ensure that the developer community is not split up and we keep the core engineers working on MySQL. If Oracle plays nice with these people, then things will improve dramatically with MySQL development,” notes Monty.

So that's back to Square One!

Everything will depend on what Oracle does with MySQL. In a scenario like this, MySQL users must be sweating over concerns about the future of a product their businesses depend on.

However, this is where the beauty of open source comes into the picture. No one owns the project, but only the brand. “The whole idea with FLOSS software is that it doesn't matter who owns it even remotely as much as it does for closed-

source software. So they [customers and users] can continue to use MySQL whatever happens. And there are still tons of good MySQL support people at Sun, so there is no problem buying support from Sun,” says Axmark.

And just in case Oracle doesn't play nice, you can always fork the project. “With the current licence, there is no problem to fork. There are already several existing forks,” says Monty. “The newest 'branch' is MariaDB that I am working on. We already have many of the core MySQL developers working on this so we have the competence to do this properly.”

However, many feel that though forking might be easy, maintaining the fork and ensuring its popularity is the biggest challenge. Also, a customer might be wary of going for an unknown project instead of a well-known one. So, how can a fork be successful? Monty argues, “The brand popularity gives some protection for Oracle, but it has

“Oracle is a big player in the enterprise software market, and just like Microsoft, once it gets one product to a customer, it will try and use that installation as a lever to get other products in. Up till now, those at Oracle haven’t made a serious attack on the desktop space. Maybe OpenOffice.org will give them an incentive to do so.”

—John McCreesh, marketing product lead, OpenOffice.org



been shown before in the open source world that name changes of products can be done quickly. Just look at how quickly Firefox was adopted. The reason for being able to change quickly is that MySQL is a product mainly used by developers. Developers are quick to find and go with new trends, and if one fork gets a lot of attraction from the community it can take over very quickly.”

If Oracle realises the benefits of MySQL and boosts its development to capture new markets, it would be the best for the community and the customers. In case it fails to do so, customers don’t have to worry; there will always be a fork ready.

OpenOffice.org: The road to independence

OpenOffice.org (OOo) is one product that may not seem to fit in Oracle’s game plan, and thus might have a hard time under the database giant’s umbrella. John McCreesh, marketing project lead, OpenOffice.org, has this to say,

“IBM already has its own commercial OpenOffice.org derivative, so it has a clear financial interest in keeping the project going as long as there is an active body of developers working on it. IBM is better known than Oracle in OpenOffice.org circles.”

But, an office suite is a product that is an absolute, basic requirement for any enterprise. It also ensures penetration into new segments. Heavy deployments at big enterprises as well as government agencies mean huge revenues. This has been Microsoft’s bread and butter for ages. IBM and Novell both realise this and that’s why they have their own OOo derivatives—Lotus Symphony and GO-oo, respectively.

Oracle knows this only too well. An office suite was one important component missing from making Oracle the Apple of the enterprise world. So, the estimation is that Oracle might try to optimise OOo for its Oracle Collaborative and e-Business suites. The level of integration could go as high as

pulling data from the Oracle backend database into OOo components, thus offering newer solutions to its customers.

This may seem a bit out of focus, but Microsoft is Oracle’s archrival and an office suite is an important part of Microsoft’s backbone. Oracle may not let go of an opportunity to annoy Microsoft and dig into its market. Apple also depends heavily on third-party office suite applications, so a polished version will only mean constant flow of money for Oracle. If Oracle makes a mistake here, OOo will be forked by the community and be adopted by either IBM or Novell, and the potential market will slip from Oracle’s hands. But, considering the support Oracle offered for ODF (Open Document Format—an ISO standard for office document formats, and the default used in OOo), it is hard to believe that Oracle will let go of a potentially lucrative market.

“Oracle is a big player in the

A culture shock for Sun developers at Oracle

Sun was known as an open source company, but Oracle doesn’t have that reputation. But according to Lachal, “Oracle will definitely be a culture shock for the people at Sun, but that has not much to do with open source (and again I need to repeat that Oracle is not new to open source at all—open source is, indeed, very small in the grand scheme of Oracle things, but Oracle is better placed to make money out of it than Sun). The two companies had a very different culture—one rather laid back and, from a software point

of view, not particularly effective; while the other is very aggressive, pragmatic and much more effective (but, I suspect much less fun).”

Tiemann adds, “Oracle has been contributing to the Linux kernel for quite some time, and they get no special treatment—good or bad—from that community. If you are talking about Sun’s engineering teams now reporting to Oracle managers, I’m sure that differences in management/leadership style will be a shock for some and not for others.”

Ingres' take on the deal

When it comes to core database servers, Ingres is arguably the most feature-complete open source competitor of Oracle DB. Here's what Roger Burkhardt, CEO, Ingres Corporation, has to say about the acquisition...

The revenue and earnings momentum from the string of acquisitions that Oracle has made is forcing it to buy into the hardware business, as it has run out of software assets to buy. The timing is interesting as, starting next quarter, the BEA acquisition will no longer mask any slowdown in revenues or margin improvements in the core business (BEA closed on April 29th, 2008). When this deal goes through, then Oracle will become a single-stack hardware, OS and applications company—a market position that HP has always avoided, and IBM had to retreat from. As a result, many hardware manufacturers will be reassessing their relationships with the combined Sun-Oracle combo—and this will open up opportunities for other software infrastructure players like Red Hat and Ingres.

We are witnessing the beginning of the end of the whole 1980s proprietary IT era as the “New Economics of IT” takes over, and customers switch out of extraordinarily high-cost hardware and software, and migrate to open source and open standards. Oracle may be billing this merger as the beginning of the “next phase of computing”, but they are missing the point. The demise of Sun has been caused by the “next phase of computing” which Ingres sees as the emergence of open source and open standards in the “New Economics of IT”. Oracle may believe that by locking in the customer at the hardware, OS and applications level it can hold back the inevitable, but history speaks otherwise.

Oracle is claiming the merger as a major profit-making opportunity that will enable it to squeeze customers and run Sun at “substantially higher margins”. This is consistent as it has raised prices dramatically on BEA’s Weblogic application server after that acquisition, and drove many customers to seek open source offerings such as Red Hat’s JBoss. JBoss, Ingres, and other open source offerings provide the “New Economics of IT” that does away with predatory pricing tactics, and encourages open standards and competition rather than proprietary lock-in.

The cause of Sun’s demise lies in the commoditisation of its hardware business from open source and open standards. The compelling cost advantage of Linux on commodity hardware squeezed out the revenue and profit from Sun’s SPARC server business and its software business is tiny by comparison.

Oracle wants the Solaris operating system and it wants to control Sun’s Java assets

to compete with the strength of Microsoft’s development ecosystem. The MySQL database and GlassFish application server come free with the package, and Oracle won’t allow them to cannibalise the license revenues from its core database and Weblogic application server business. GlassFish/MySQL will be positioned as developer offerings that provide an easy ‘on ramp’ to production use of Oracle’s proprietary offerings. Customers won’t see the long-term investments required to create a competitive enterprise-class database, and are likely to see MySQL make even more use of proprietary Oracle interfaces and management tools.

This is mostly negative for users. Oracle claims in its release that they can wring more profit out of existing Sun assets, but history shows this will largely come out of users’ pockets. ISVs and their customers will be worrying about price increases for their Java licences.

Given that Oracle bought the InnoDB product line from Innobase in October 2005 (a storage engine that complements the MySQL database), we would expect them to reintegrate InnoDB with MySQL. This involves undoing the work of the past three years, and so creates additional delays and uncertainty about upgrade strategies for MySQL users stranded on old releases.

Oracle’s history of predatory pricing and business practices probably makes this a negative outcome for software users. However, both companies have massive licence revenue conflicts that undercut any interest in growing Sun’s open source assets.

We don’t view this as a monopoly but it reduces competition in the RDBMS space by removing the threat of MySQL ‘going up-market’ from its base in Web applications to compete with Oracle’s enterprise class database. However, Ingres already provides a proven choice in this space. There is also a negative impact on Sybase, which has its largest DBMS install base on Solaris, and many users are already reconsidering the use of Sybase long term and considering open source and other alternatives. Oracle sales teams will now have visibility and access via Solaris and can argue for consolidation under an Oracle contract.

On the positive side, Oracle is motivated to continue to invest in Java to create an alternative to Microsoft’s developer ecosystem and MySQL will continue to serve much of the Web. From a database and application server perspective, this will eliminate the future evolution of MySQL/GlassFish into credible open source alternatives to proprietary offerings for enterprise-class infrastructure. However, right now, Red Hat’s JBoss and the Ingres database already provide more mature and capable alternatives in both these two categories. So from a user perspective, open source competition is maintained.





“The whole idea with FLOSS software is that it doesn’t matter who owns it even remotely as much as it does for closed-source software. So they [customers and users] can continue to use MySQL whatever happens. And there are still tons of good MySQL support people at Sun, so there is no problem buying support from Sun.”

—David Axmark, co-founder, MySQL Database

enterprise software market, and just like Microsoft, once it gets one product to a customer, it will try and use that installation as a lever to get other products in. Up till now, those at Oracle haven’t made a serious attack on the desktop space. Maybe OpenOffice.org will give them an incentive to do so,” says McCreesh.

He also warns that if something goes wrong at Oracle, the OOo community as a whole will not hesitate in making the office suite an independent entity. He points out, “There have been discussions around creating a foundation for the independent development of OOo. I think that’s a real possibility if Oracle is not interested in OpenOffice.org or withdraws the sponsorship that Sun Microsystems used to provide.”

Well, to twist around an old fashioned greeting a little, “May the fork be with you!”

Hitting at Microsoft

Customers are looking for heterogeneous environments, and they find Red Hat and Oracle to be a

better choice than Microsoft. While Red Hat is the leading open source company, Oracle offers a mix. The latter will be able to address any query that a customer might have regarding the entire stack—from the operating system layer to the application layer.

The buyout of Sun will put Oracle in a much stronger position against its ‘favourite’ rival Microsoft. Let’s face it—Ellison never misses an opportunity to punch Microsoft. This is the first time he will have all the required arrows in his quiver to make a dent in Microsoft’s armour.

The company is now a complete vendor—it has its own hardware, operating systems to run on those hardware, middleware, the mother Java, the most popular databases (whether open source or proprietary), an office suite, and many more technologies. Seems like it’s becoming a multi-polar world, with Microsoft, IBM and Oracle in the ring.

And let’s face it, most customers would prefer going for Oracle’s stack than Microsoft’s. The fact is that many

companies are migrating to GNU/Linux and Microsoft has been doing nothing but token lip service regarding its uncertain and dubious interoperability efforts. In the case of Oracle, everything will be well-optimised and well supported. If customers face any problems—from operating system to database, or office suite to middleware, all they have to do is dial Oracle.

This seems to be an end to the dominant, dictatorial Microsoft era. IBM, on the other hand, will also have a giant to compete with. The three players will keep a check on each other. The result? The community and the customer will win. 

List of Oracle’s open source projects:

- <http://oss.oracle.com/projects/>
- <http://www.oracle.com/technologies/linux/linux-tech-leadership-contributions.html>
- Some other major projects include:
- Oracle modifications to Glassfish Project (CDDL-licensed) source files.
- The Mozilla Thunderbird Extension for Oracle Collaboration Suite users

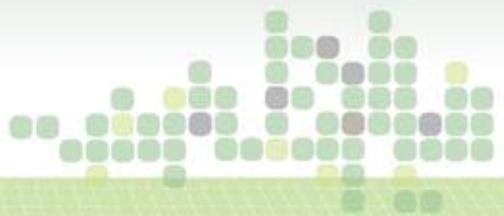
By: Swapnil Bhartiya

A Free Software fund-a-mental-ist and Charles Bukowski fan, Swapnil also writes fiction and tries to find cracks in a proprietary company’s ‘paper armours’. He is a big movie buff and prefers listening to music at such loud volumes that he’s gone partially deaf when it comes to identifying anything positive about proprietary companies. Oh, and he is also the assistant editor of *EFYTimes.com*.

Unanswered questions

Since both the involved parties are keeping mum, there are several areas where some questions are still unanswered. Tony Wasserman says, “The biggest problem surrounds the GlassFish application server, since Oracle recently acquired BEA with its commercial Java application server. Oracle also had its own Java application server, but I don’t think that they are still investing in its development. I would not be surprised if Oracle reduced the staffing commitment to GlassFish, but that is not the same as killing the project.”

Industry News



Intel fined a record \$1.45 billion by EU

The European Commission has imposed a fine of \$1.45 billion on Intel Corporation for violating the EC Treaty antitrust rules on the abuse of a dominant market position (Article 82). The EC finds Intel guilty of engaging in illegal anti-competitive practices to exclude competitors from the market for computer chips called x86 central processing units (CPUs). The EC has ordered Intel to cease the illegal practices immediately to the extent that they are still ongoing. The \$1.45 billion fine is reportedly the biggest-ever penalty the EC has imposed on a company for anti-competitive practices.



The Commission's investigation followed complaints from AMD in 2000, 2003 and 2006 (the last having been sent to the German competition authority and subsequently examined by the EC). The Commission's decision follows a Statement of Objections sent in July 2007, a Supplementary Statement of Objections sent in July 2008 and a letter sent to Intel in December 2008 setting out additional factual elements relevant to the final decision. Intel's

rights of defence have been fully respected in this case, the Commission said.

Paul Otellini, president and CEO, Intel, disputed the EU ruling and stated that the company would appeal against the Commission's verdict. Otellini said, "Intel takes strong exception to this decision. We believe the decision is wrong and ignores the reality of a highly competitive microprocessor marketplace—characterised by constant innovation, improved product performance and lower prices. There has been absolutely zero harm to consumers. Intel will appeal."

Throughout the period October 2002-December 2007, Intel had a dominant position in the worldwide x86 CPU market (at least 70 per cent market share). The Commission found that Intel engaged in two specific forms of illegal practice. First, Intel gave wholly or partially hidden rebates to computer manufacturers on condition that they bought all, or almost all, their x86 CPUs from Intel. Intel also made direct payments to a major retailer on condition it stock only computers with Intel x86 CPUs. Such rebates and payments effectively prevented customers, and ultimately consumers, from choosing alternative products. Second, Intel made direct payments to computer manufacturers to halt or delay the launch of specific products containing competitors' x86 CPUs and to limit the sales channels available to these products. The Commission found that these practices constituted abuses of Intel's dominant position on the x86 CPU market that harmed consumers throughout the EEA (European Economic Area). By undermining its competitors' ability to compete on the merits of their products, Intel's actions undermined competition and innovation. The Commission said it would actively monitor Intel's compliance with this decision.

The world market for x86 CPUs is currently worth approximately \$30 billion per year, with Europe accounting for approximately 30 per cent of that.

"Intel has harmed millions of European consumers by deliberately acting to keep competitors out of the market for computer chips for many years," said Neelie Kroes, competition commissioner, EU. "Such a serious and sustained violation of the EU's antitrust rules cannot be tolerated."

The computer manufacturers linked with Intel are: Acer, Dell, HP, Lenovo and NEC. The retailer concerned is Media Saturn Holding, owner of the MediaMarket chain.

Linux Foundation unveils new Linux.com

The Linux Foundation (LF), the non-profit organisation dedicated to accelerating the growth of Linux, formally launched the Linux.com portal. LF took over stewardship of the site in March this year, at which time it began soliciting inputs from the community to help define the new Linux.com via its Ideaforge Web tool. Now it has unveiled the results of that input with a new online home for all things Linux.



The new Linux.com will connect Linux users and developers, and by showcasing their skills through its guru listing, will connect individuals to jobs and collaboration opportunities. Instead of a static information site, the new Linux.com will empower the Linux community to share its knowledge, get questions answered, download the right software and find hardware to solve problems.

Visitors can register and immediately begin contributing to the community and build their Linux guru standing. Other community functions include allowing users to have their own blogs hosted by Linux.com, review products in the product directory, and submit how-tos and tutorials to help fellow Linux users or developers. Inaugural Linux.com sponsors include Intel, NetApp, Novell and Red Hat.

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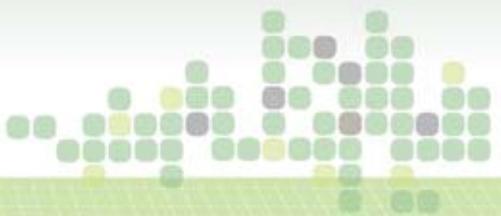
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Industry News



Android's growth in 2009 slated to outpace all other mobile OSs

According to industry analysts, Strategic Analytics, globally, Android smartphone shipments will grow 900 per cent in 2009. The market watchers believe that healthy support from operators, vendors and developers will drive adoption. The



same analysts claim that Apple's iPhone OS will be the next fastest-growing smartphone operating system in 2009, with a 79 per cent growth rate.

Added Neil Mawston, director, Strategy Analytics, "Android has fast been winning healthy support

amongst operators, vendors and developers. A relatively low-cost licensing model, its semi-open-source structure and Google's support for cloud services have encouraged companies such as HTC, Motorola, Samsung, T Mobile, Vodafone and others to support the Android operating system. Android is now in a good position to become a top-tier player in smartphones over the next two to three years."

The 900 per cent figure has raised eyebrows, since as of Q2, only a million Android-powered handsets have been shipped. It would require over another 5 million handsets to reach the market, to qualify for the 900 per cent claim. IDC pegs Android's growth rate at a more realistic 420 per cent. And backs the Blackberry OS for second place, rather than the iPhone OS.

The third Blender movie in the pipeline

Blender's third short 3D animation film will be based on the work of renowned author Martin Lodewijk. The 3D film—financed via the Internet and created with open source software—will be distributed freely. Producer Ton Roosendaal from the Netherlands-based Blender Institute is working with comic book author

Martin Lodewijk on Blender's third short 3D animation

movie. The film, with working title 'Durian', will be released and distributed as open content. Users and sponsors of the 3D program Blender will finance this project, with the main goal to further develop publicly available advanced 3D animation techniques. The production will start in September, and is expected to get a worldwide premiere in April 2010. For more information, go to: durian.blender.org

The Blender Institute is the studio spin-off of the Blender Foundation, which organises and facilitates online projects to further develop the open source Blender 3D creation suite. With over 3.5 million downloads annually, Blender now is one of the most popular programs worldwide for 3D artists and animators.



Intel, Novell to drive Moblin adoption

Intel and Novell have announced broad efforts to closely collaborate and encourage OEMs and ODMs (original design manufacturers) to adopt Moblin, an optimised open source Linux software platform to enable rich Internet experiences on Intel Atom processor-based netbooks and other mobile systems. Intel and Novell signed an agreement outlining their plans for collaboration. Novell also announced it will create a Moblin-based product for netbooks that it will market to a wide range of OEMs and ODMs. Additionally, Novell will establish Novell Open Labs in Taiwan to foster the adoption of Moblin and will work with the Taiwan Moblin Enabling Center (MEC), a joint effort of Intel and the Taiwan Institute for Information Industry, to validate designs for Moblin compliance.

Sun reports surge in adoption of the Sun Unified Storage Family

Sun has announced that hundreds of customers across a range of industries have purchased high-performance, eco-efficient Flash-enabled Sun Storage 7000 Systems to store more than 17 petabytes of data, making it the fastest ramping new product in Sun's storage portfolio ever. Continuing to add innovation to its Open Storage portfolio and Open Network Systems strategy, Sun also announced hardware capacity enhancements to the Sun Unified Storage family and an upgrade to its Analytics software, which ships with the Sun Storage 7000 line and gives storage administrators unparalleled insight into their storage systems. For a demo of the enhanced Sun Unified Storage family or to download software, you can go to www.sun.com/unifiedstorage.

The Open Database Alliance launched

Monty Program Ab, a MySQL database engineering company, and Percona, a MySQL services and support firm, have announced the 'The Open Database Alliance', a vendor-neutral consortium designed to become the industry hub for the MySQL open source database, including MySQL and derivative code, binaries, training, support, and other enhancements for the MySQL community

and partner ecosystem. The Open Database Alliance will comprise a collection of companies working together to provide the software, support and services for MariaDB, an enterprise-grade, community-developed branch of MySQL.

The intent of the Open Database Alliance is to unify all MySQL-related development and services, providing a solution to the fragmentation and uncertainty facing the communities, businesses and technical experts involved with MySQL. Still under development, the Open Database Alliance is open to all businesses, organisations and individuals interested in helping create a new, centralised resource for MySQL and to ensure that it remains a top quality, high performance open source database.

Monty Program Ab, founded by Monty Widenius, the 'father' of the MySQL database, and Percona, established by MySQL expert Peter Zaitsev, are the founding members of the Open Database Alliance. Monty Program is currently the primary developer of MariaDB, a branch of the MySQL database that includes all major open source storage engines, including the Maria transactional storage engine. "Our goal with the Open Database Alliance is to provide a central clearinghouse for MySQL development, to encourage a true open development environment with community participation, and to ensure that MySQL code remains extremely high quality," noted Monty. "Participating members at this stage in the 'Alliance' will have a strong voice in how the organisation is structured, and we look forward to collaborating with anyone in the industry that provides or depends on MySQL."

Oracle buys Virtual Iron

Oracle has agreed to acquire Virtual Iron Software (Virtual Iron), a provider of server virtualisation management software that enables dynamic resource and capacity management in virtualised data centres. The combination of Virtual Iron's technology and Oracle VM's scalable, high performance and highly available server virtualisation product is expected to provide more comprehensive and dynamic resource management across the full software stack. The company claims that customers are expected to benefit from better capacity utilisation, streamlined virtual server configuration, and improved visibility and control of their enterprise software. The transaction is subject to customary closing conditions and is expected to be concluded this summer.

Until the deal closes, each company will continue to operate independently. Financial details of the transaction were not disclosed.



LinuxCon stated for Sept 21-23, 2009

The Linux Foundation (LF) has confirmed the dates for LinuxCon 2009. The event combines the developer and end user communities, resulting in more than 75 sessions that address "all matters Linux". The event will take place on September 21-23, 2009 in Portland, Oregon at the Marriott Downtown Waterfront.

LinuxCon represents both community and industry, fielding luminaries such as Mark Shuttleworth and industry experts such as IBM's Bob Sutor. Confirmed keynote speakers include: Joe "Zonker" Brockmeier, openSUSE



Joe Brockmeier
Novell



Bdale Garbee
Hewlett-Packard



Mark Shuttleworth
Canonical Ltd.



Bob Sutor
IBM

community manager, Novell; Bdale Garbee, open source and Linux chief technologist at Hewlett Packard, well-known kernel developer; Mark Shuttleworth, founder of the Ubuntu distribution and Canonical; and Bob Sutor, vice president of Standards and Open Source at IBM.

Three tracks—developer, business and operations—will provide the foundation for sessions that include tutorials, keynotes, a technology showcase and targeted mini-summits on topics such as mobiles, the desktop, the embedded space, and much more. LinuxCon will be co-located with the annual Linux Plumbers Conference (LPC), which attracts a star-studded pool of technical talent. Registration is now open. Early Bird registration costs \$299 per person (until June 1, 2009), and Standard registration costs \$399 (until August 14, 2009).



Enrich OpenOffice.org with Extensions

This article gives you a basic idea about programming OpenOffice.org with NetBeans support, enhancing the power of the office suite through extensions.

Want to add a feature to OpenOffice.org? You may need to download the source, build it, and then hack it for a feature development or enhancement. After all these efforts, it may take time to be accepted upstream. So the best solution is to create and distribute an extension—whoever likes it and is confident of the risks involved, can install and use it.

For this purpose, OOo supports easy development of third-party extensions with the help of an SDK (software development kit). As an extension developer you don't need the required environment (distro, architecture, disk space, etc) for building source, leave alone the knowledge about the

full development cycle of the core. You can start off with extension development with much less effort.

Overview of extensions

Extensions add additional functionality to the core OOo office suite, which can be deployed or removed independently. It can be in the form of UI components, custom functions for Calc, data pilots, new chart types, a spell-checker, etc. Some extensions like templates don't require coding at all, as they are considered non-programmatic extensions.

OOo supports extension development in various languages like C++, Java, Basic, Python, Ruby, etc. It is suggested that

you choose a language that is platform-independent to write extensions, in order to avoid recompilation of code for each platform. Extensions written in Basic are considered as macros, and were discussed in the article in LFY's May 2009 issue, *Automate Your Work with OpenOffice.org Macros*, Page 52. This month I will explain programming with Java, with the help of the NetBeans plug-in.

The OOo SDK

The SDK is the key prerequisite for writing extensions. It provides tools, the build environment, and the documentation required for programming. It also provides a good set of examples to start learning. It is available as a separate download for various platforms like Linux, Solaris, Mac, Windows, etc. The package repositories of some of the distros also include it. The SDK provides detailed documentation of APIs in the form of the Developer Guide. Some languages are well supported by the SDK and some are under development.

The SDK will be installed in any of the following possible paths:

- /usr/lib/openoffice/basis3.1/sdk
- /opt/openoffice.org/basis3.1/sdk

The SDK configuration is not covered in this article, as setting up the NetBeans plug-in will automatically take care of it.

Setting up the IDE

Download and install the latest version of the NetBeans IDE—the current version as of today is 6.5.

Go to *Tools*→*Plugins*→*Available plugins*. Select *OpenOffice.org API Plugin*, download and install it—currently, 2.0.4 is the latest version.

Go to *Tools*→*Options*→*Miscellaneous*→*OOo API Plugin*. By default, the SDK path is detected automatically—if so, verify it; else, provide the correct path.

Now the SDK and NetBeans are configured properly, and we're ready to get started with our extensions development.

Types of projects

You can create four types of projects with the help of this plug-in:

- *OpenOffice.org Add-On*: An add-on is a UI extension in the form of a menu item or tool bar item.
- *OpenOffice.org Calc Add-In*: A Calc Add-In provides custom functions to spreadsheets.
- *OpenOffice.org Component*: It helps to develop UNO-based applications.
- *OpenOffice.org Client Application*: It helps to create client applications to bootstrap UNO and get a reference for running an office instance locally or remotely.

In this article we'll discuss the first two types of projects.

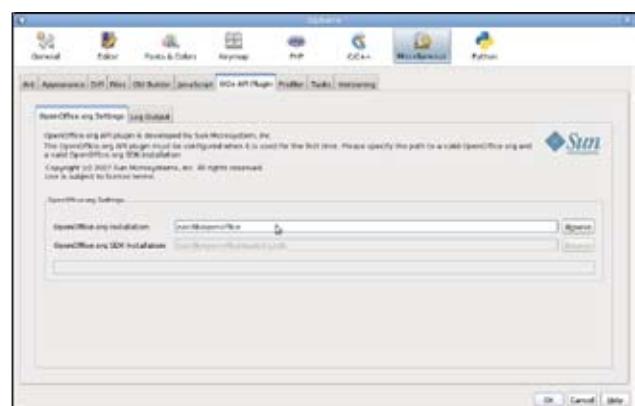


Figure 1: Setting up the OOo SDK

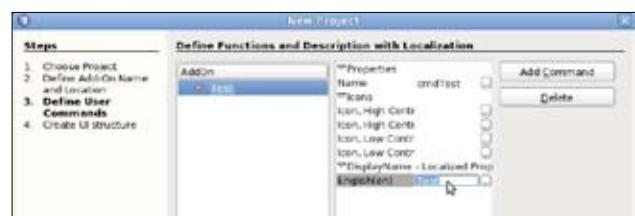


Figure 2: Add-on wizard: Command properties

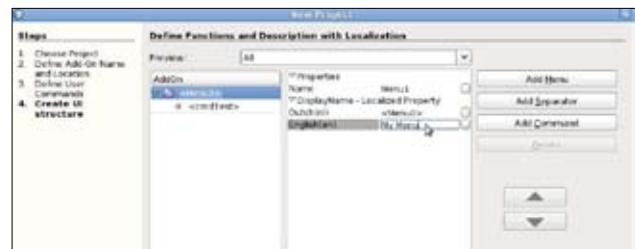


Figure 3: Add-on wizard: Menu properties

A simple add-on project

In this example, we'll create a simple add-on, which will load a new Calc document, insert a new sheet into it with the name "Hello", and change the contents of the A1 cell to 20.

Start the Add-on wizard using *File*→*New Project*→*OpenOffice.org*→*OpenOffice.org Add-on*. In the next screen, fill in the project name, say "Simple", which will be the default name for the *Main* class also. Then fill in a suitable package name, say *org.lfy.example*, and a suitable location to store the project. Finally, select whether the add-on should come as a menu item, a toolbar item or both.

In the next screen (Figure 2) give a suitable name for the command, say *cmdTest* in place of 'Command0', which is there by default, and the display name as *Test*. We can leave the 'Icon' field empty for the moment. Note that we can create more than one command using the *Add Command* button; however, in this example we will restrict ourselves to one command only.

In the next screen, we can create the menu properties, such as its name, etc (Figure 3).

On the same screen and the next one, select the

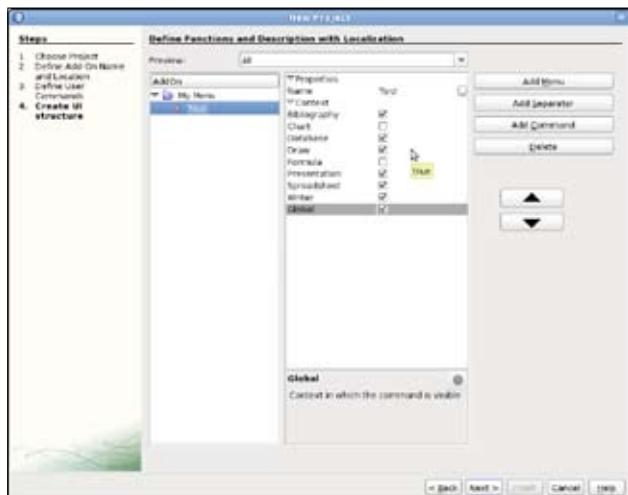


Figure 4: Add-on wizard: Context selection

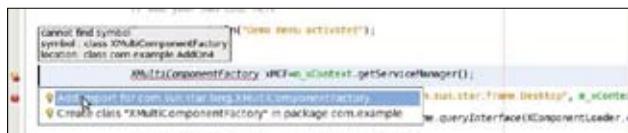


Figure 5: Add-on wizard: Adding the import package in NetBeans

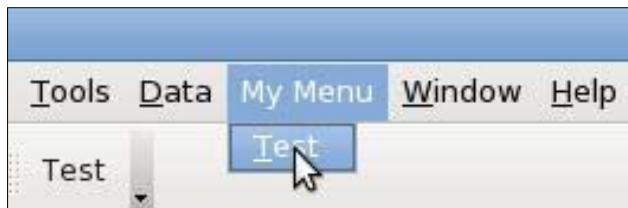


Figure 6: Add-on wizard: After the deployment of add-on

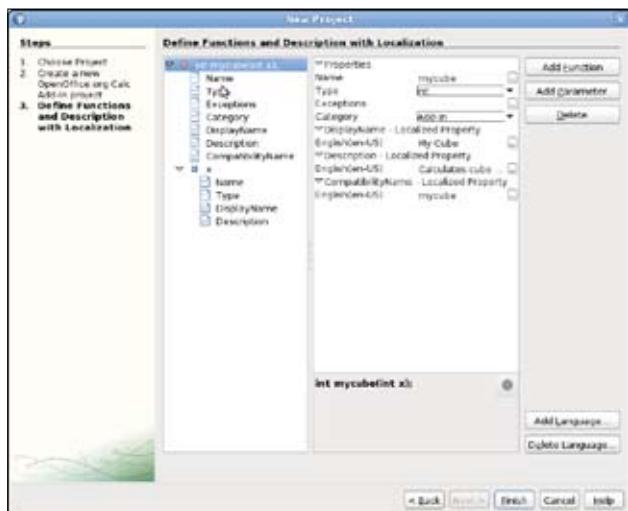


Figure 7: Add-in Wizard: Function properties

contexts of OOO for the menu and tool bar item in which they should be displayed. The UI item will be available in those contexts only—for example, on selecting the Writer context, the UI component will be displayed in the Writer component.

Once this add-on is created, context and display

names can be changed by editing the *Addons.xcu* file, which is available at *Simple* → *OXT* → *registry* → *data* → *org* → *openoffice* → *Office*

That's it! The project has now been successfully created. Go to the project navigator and open the code for the Main class—*Simple* → *Source Packages* → *org.ofy.example* → *Simple.java*

In the dispatch method, look for the following lines:

```
1 if ( aURL.Path.compareTo("Test") == 0 ) {
2     // add your own code here
```

Add the following code in their place. This code requires many packages to be imported, which are not listed here, but NetBeans will help you automatically import the required packages (Figure 5).

```
2 try {
3     XMultiComponentFactory xMCF=m_xContext.getServiceManager();
4     Object desktop= xMCF.createInstanceWithContext("com.sun.star.frame.XComponentLoader",
5     frame.Desktop",
6         m_xContext );
5     XComponent Loader xCL=( XComponentLoader )
6         UnoRuntime.queryInterface(XComponentLoader.class, desktop
7 );
8     PropertyValue [] loadProps = new PropertyValue [0];
9     String strDoc = "private:factory/scalc";
10    XComponent xComp = xCL.loadComponentFromURL(strDoc, "_blank",
11    0, loadProps );
12    XSpreadsheetDocument xSDoc = (XSpreadsheetDocument)
13    UnoRuntime.queryInterface(
14        XSpreadsheetDocument.class, xComp);
15    XSpreadsheets xSheets = xSDoc.getSheets();
16    xSheets.insertNewByName("Hello", (short)3);
17    XIndexAccess oIndexSheets = (XIndexAccess) UnoRuntime.
18    queryInterface(
19        XIndexAccess.class, xSheets);
20    XSpreadsheet xSheet= (XSpreadsheet) UnoRuntime.queryInterface(
21        XSpreadsheet.class, oIndexSheets.getByIndex(3));
22    XCell xCell=xSheet.getCellByPosition(0, 0);
23    xCell.setValue(20);
24    xSheet.getCellByPosition(3, 4).setFormula("=rand()");
25 }catch(Exception e){System.out.println("err:"+e);}
```

The following is a brief description of the given code:

- Line 3-5: Create a new instance of OOO from ServiceManager
- Line 6-8: Load a blank Calc document within the created instance
- Line 10: Get a reference to all sheets in the document
- Line 11: Insert a new sheet with the name as *Hello*
- Line 12-13: Get a reference to the fourth sheet through the index
- Line 14-15: Change the content of the A1 cell to 20
- Line 16: Set the formula =rand() for the D5 cell

To build and deploy this, right click on *Project* and use the options *Build, Deploy and Run Extension in OpenOffice.org*. Or the *Create OXT* option can be used to create a packaged extension in the *oxt* format, which can be deployed using the extension manager.

You will now see a new menu title, *My Menu*, under which a menu item *Test* is shown in the selected contexts. Also, a toolbar item named *Test* is created. Either of these help to run the required code.

A simple add-in project

In this example, we will create a simple add-in to provide a custom function called 'mycube' to Calc documents.

Start the *Add-in* wizard using *File → New Project → OpenOffice.org → OpenOffice.org Calc Add-in*. In the next screen, fill in the suitable data for the project – the name, add-in name, package name, project location, etc. In this example, the following data is assumed: *SimpleAddin* as the project name as well as add-in name, *org.ofy.example* as the package name and the suitable path for the project location.

In the next screen, choose the function name, return type, parameter name and data types.

Now, from the project navigator, select *SimpleAddin Project*; under *Source Packages, org.ofy.example* package, and edit *SimpleAddinImpl.java*. In this file, find the code for the desired function, i.e., find the line *public int mycube(int x)*. Complete the code for this function as follows:

```
public int mycube(int x)
{
    return x*x*x;
}
```

Build and deploy this extension like in the earlier example. To test this add-in, open any Calc document and write the following formula in any cell:

```
=mycube(10)
```

...which will give 1000 as the result, as expected. Also, *mycube* is available in the list of Calc functions under the Add-in category now.

Deployment and publishing

The plug-in provides a direct option to deploy and run extensions, or to create an *oxt* file for later deployment through the extension manager. Also, extensions can be removed or updated using the extension manager or they can even be disabled and enabled without removal.

Once an extension is developed and tested, it can be published to the *extensions.services.openoffice.org* repository.

You can also use the project option *Publish Extension on OpenOffice.org Website* for publishing.

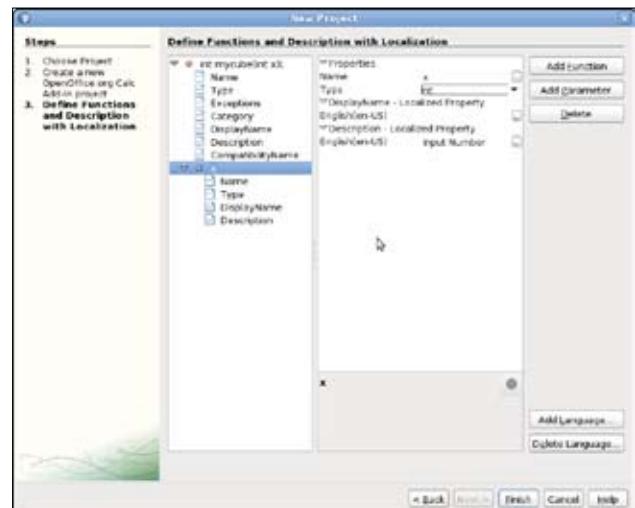


Figure 8: Add-in Wizard: Parameter properties



Figure 9: Extension manager

To release a modified extension with the new version, open *Project Name → OXT → description.xml*.

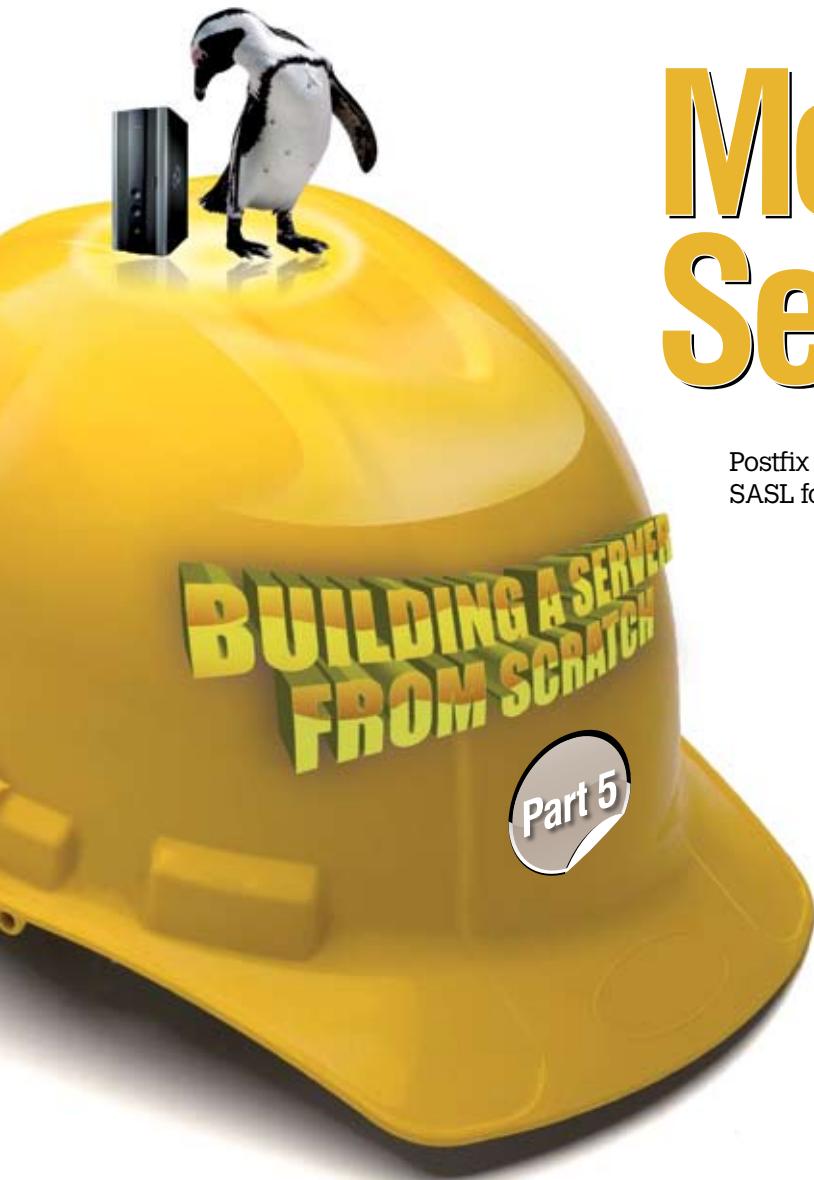
Edit the version number build and create a *OXT* file, or deploy it directly. 

Resources

- OOo extensions wiki: wiki.services.openoffice.org/wiki/Extensions
- OOo extension repository: extensions.services.openoffice.org
- OOo API: api.openoffice.org
- OpenOffice.org Developer Guide: wiki.services.openoffice.org/wiki/Documentation/DevGuide/OpenOffice.org_Developers_Guide

By: Rajesh Sola

The author has been involved in the OOo project since 2005 and has contributed to VBA Macro interoperability, and OOo programmability through macros and extensions. He is a faculty member of the computer science department at NBKRIST, Vidyanagar. He is keen on FOSS awareness and promotion in rural areas, and is fond of teaching. He believes in training, thus encouraging and supporting students to take the open source road. You can reach him at rajesh at lisor dot org.



Messaging Services

Postfix for an MTA, Dovecot for POP/IMAP, and Cyrus-SASL for authentication... Are you ready for them?

This way, you are not bound to the server architecture I've defined, but can set up each role in your own way. You decide all the low-level details such as disk space allocation, VM set-up and all that, while I write about the way to set up each specific service.



Note: You have got to be mentally prepared to handle the barrage of settings and different configuration combinations that messaging services can throw at you. You'll also need to understand a bit of messaging terminology. You'll also need a Web server and a MySQL server. PostgreSQL will not do.

*H*ey, I hope you've fiddled around with that WordPress installation enough to suit your needs. Or, did you install Drupal or Joomla instead? Whichever CMS it is, I'm sure you've been able to customise it to your requirements.

As promised earlier, this month we'll concentrate on setting up a mail server. However, there's a slight change in the instruction model: I'll write about each role in a generalised way from now on.

Terminology

Let's learn a bit about messaging terminology:

1. Mail Transfer Agent (MTA): This is the program that actually sends messages from your account to other accounts and receives mail from other accounts.
2. MX Record: The Mail eXchanger record in a DNS system specifies the machine that is used to handle e-mail on the network. There can be multiple MX records for a given network.
3. Post Office Protocol (POP) 3: POP is a protocol, such as HTTP, used for communication between a mail client

(such as KMail) and your mail server. In POP, all the mails are downloaded to the user's PC.

4. Internet Mail Application Protocol (IMAP): This, for all practical purposes, does the same thing as POP, but there is one major technical difference. In IMAP, the mail is not downloaded to the user's PC, but is kept on the server itself. In essence, the mail client (such as KMail or Outlook) acts as an online browser for the mails on the server.
5. Web mail application: A Web mail application enables access to our mails using a Web interface. What we use at mail.google.com when we want to check our Gmail accounts is a Web mail interface to Google's POP, IMAP and SMTP servers.
6. Maildir: This is a file on the server that stores all the mail folders of an account.

So you see, we need to install two pieces of server software (an MTA and a POP/IMAP server) to actually get a working messaging server. If we install only an MTA, we will be able to send and receive mails, but not read them. And with only a POP-IMAP daemon, we will only be able to read mails, not send and receive them (without receiving capabilities, from where will we get mails to read)?!

Getting started

Our software set is pretty mundane. We need an MTA and a POP-IMAP daemon. CentOS comes with Sendmail (the old and faithful MTA) installed by default, something we will do away with. The best choice for a MTA is QMail, but it's a pain to maintain. We will settle for Postfix. As for POP-IMAP, we will use the best—Dovecot.

We need some sort of an authentication mechanism, which will be provided by Cyrus-SASL. A final touch will be SpamAssassin and ClamAV, to deal with mail malice.

Installing the stuff

Open a terminal, and type the following two commands as the root user:

```
yum remove sendmail
yum install cyrus-sasl cyrus-sasl-devel cyrus-sasl-gssapi \
cyrus-sasl-md5 cyrus-sasl-plain postfix dovecot
```

This should pull in all the stuff we want, plus the dependencies.

The following section is completely based on a very helpful article at HowToForge—a link is presented at the *References* section.

Configuring the mail server

First of all, open up a terminal window. CentOS has a very annoying problem with its PATH variable; it doesn't include any of the *sbin* directories. So type in:

```
export PATH=$PATH:/sbin:/usr/sbin
```

Now to set up SASL-TLS authentication:

```
postconf -e 'smtpd_sasl_local_domain ='
postconf -e 'smtpd_sasl_auth_enable = yes'
postconf -e 'smtpd_sasl_security_options = noanonymous'
postconf -e 'broken_sasl_auth_clients = yes'
postconf -e 'smtpd_sasl_authenticated_header = yes'
postconf -e 'smtpd_recipient_restrictions = permit_sasl_authenticated,permit_mynetworks,reject_unauth_destination'
postconf -e 'inet_interfaces = all'
postconf -e 'mynetworks = 127.0.0.0/8'
```

We must edit */usr/lib/sasl2/smtpd.conf* so that Postfix allows both 'PLAIN' and 'LOGIN' log-ins. The file should look like this:

```
pwcheck_method: saslauthd
mech_list: plain login
```

Now we need to create some self-signed certificates for encryption:

```
mkdir /etc/postfix/ssl
cd /etc/postfix/ssl/
openssl genrsa -des3 -rand /etc/hosts -out smtpd.key 1024
```

Remember this passphrase you were asked for. You'll need it extensively for the next steps.

```
openssl req -new -key smtpd.key -out smtpd.csr
openssl x509 -req -days 3650 -in smtpd.csr -signkey smtpd.key -out
smtpd.crt
openssl rsa -in smtpd.key -out smtpd.key.unencrypted
mv -f smtpd.key.unencrypted smtpd.key
openssl req -new -x509 -extensions v3_ca -keyout cakey.pem -out cacert.
pem -days 3650
```

Next we configure Postfix with these certificates:

```
postconf -e 'smtpd_tls_auth_only = no'
postconf -e 'smtp_use_tls = yes'
postconf -e 'smtpd_use_tls = yes'
postconf -e 'smtp_tls_note_starttls_offer = yes'
postconf -e 'smtpd_tls_key_file = /etc/postfix/ssl/smtpd.key'
postconf -e 'smtpd_tls_cert_file = /etc/postfix/ssl/smtpd.crt'
postconf -e 'smtpd_tls_CAfile = /etc/postfix/ssl/cacert.pem'
postconf -e 'smtpd_tls_loglevel = 1'
postconf -e 'smtpd_tls_received_header = yes'
postconf -e 'smtpd_tls_session_cache_timeout = 3600s'
postconf -e 'tls_random_source = dev:/dev/urandom'
```

Then we set the hostname in our Postfix installation (make sure you replace mail.linux.bogus with your own hostname):

```
postconf -e 'myhostname = mail.linux.bogus'
```

Make sure that you are running your mail server on this computer, i.e., mail.linux.bogus (or whatever). And, most importantly, your DNS system must have at least a single A record to specify the IP address of this machine, and at least one MX (Mail eXchanger) record for this domain showing which machine will handle mails addressed to this domain. It should be something like what's shown below (in ISC BIND9):

```
$ORIGIN linux.bogus.
$TTL 3D
@ IN SOA ns.linux.bogus. hostmaster.linux.bogus. (
<snip>
mail A 127.0.0.1
MX 10 mail
```

After these configuration steps you should now have a */etc/postfix/main.cf* that has at least these values (plus the ones we configured with *postconf*):

```
queue_directory = /var/spool/postfix
command_directory = /usr/sbin
daemon_directory = /usr/libexec/postfix
mail_owner = postfix
inet_interfaces = all
mydestination = $myhostname, localhost.$mydomain, localhost
unknown_local_recipient_reject_code = 550
alias_maps = hash:/etc/aliases
alias_database = hash:/etc/aliases
debug_peer_level = 2
sendmail_path = /usr/sbin/sendmail.postfix
newaliases_path = /usr/bin/newaliases.postfix
mailq_path = /usr/bin/mailq.postfix
setgid_group = postdrop
```

By default, the CentOS' Dovecot daemon provides only IMAP and IMAPs services. Because we also want POP3 and POP3s we must configure Dovecot to do so. We edit */etc/dovecot.conf* and one single line:

```
protocols = imap imaps pop3 pop3s
```

This should be near the top. Do not touch any of the other commented-out lines. Without those directives, the default ones are used, and any non-default values will mess up our server. That's a guarantee!

Now start Postfix, saslauthd, and Dovecot:

```
chkconfig -levels 235 postfix on
chkconfig --levels 235 saslauthd on
chkconfig --levels 235 dovecot on
service postfix start
service saslauthd start
service dovecot start
```

Google apps for SMEs

The target audience for this server series comprises home enthusiasts and Small-Medium Enterprises, although it's a bit biased towards the former. What if you run an SME and lack the funds and/or the necessary support infrastructure to support a server? All is not lost. There is hope... In SaaS.

Google Apps for Business is a classic SaaS (Software as a Service) offering from the Internet people. It offers you e-mail, a calendar, Google Docs, Google Video and Google Sites. Everything is standards compliant; for example, e-mail comes with POP and IMAP, the calendar with iCal, Docs can work with MS Office as well as Open Document Formats, and videos with x264 videos. And, you get to have your online portal with Google Sites. However, at \$50 per user account per year, it's not cheap.

With the Google Apps Standard Edition, you get mail, a calendar, Docs and Sites. There's no video, and e-mail space is somewhat limited. However, it's still a very capable tool, and hey, it's free! I'm signing up for it. I'll use it for my second website. Heh Heh...

Setting it up is pretty painless. Go to www.google.com/apps/intl/en/group/index.html, and then click on the big blue button. Enter your domain name, and select 'Administrator'. Hit the button now.

1. This is the first step. Well actually, it's step 2 of 3. A free GA account is limited to 50 accounts. Now fill up this form, and hit *Continue*.
2. Now you set up your admin account, review the licence agreement and hit '*I accept*'.

You're done! Well, almost. After sign-up, you're automatically directed to the control panel, where the first thing you must do is verify your domain. Verification can take up to 48 hours to complete. After that, it's smooth sailing. You can activate services one by one, including mail (with 7 GB of storage), the calendar, Chat, Sites and Docs. Happy SaaSing! As long as you have less than 50 employees, of course.

What we are going to do now is have fun, if not anything else. We are going to log in to Postfix and manually run SMTP commands. The purpose? Checking if TLS works successfully.

Type in the following code:

```
telnet localhost 25
```

You should get the response given below:

```
Trying 127.0.0.1...
Connected to localhost.localdomain (127.0.0.1).
Escape character is '^].
220 server1.example.com ESMTP Postfix
```

Now run an SMTP command at the blank line:

```
ehlo localhost
```

And scan for these two lines:

```
250-STARTTLS
250-AUTH PLAIN LOGIN
If they show up, congratulations. TLS works. Type in quit and get out of
there.
```

Configuring e-mail clients

For e-mail clients, use the following settings:

1. Incoming server type: POP3 (or POP)
2. Outgoing server type: SMTP
3. Incoming server encryption: TLS
4. Outgoing server encryption: TLS
5. Incoming authentication type: PLAIN
6. Outgoing authentication type: PLAIN or LOGIN
7. Outgoing server requires authentication: Yes
8. POP Server: <The server with the MX record>
9. IMAP Server: Same as POP Server
10. Usernames: The username in question without the “@ domain” part.

Technical information

1. Mail storage format: Maildir
2. Maildir location: `/var/mail/username` [The Maildir is actually a file]
3. User account system: One mail account per user in the system. This effectively means that anyone who wants a mail account on our server has to have a user account on the mail machine. This is a bit cumbersome, and can be avoided by setting up and instructing both Dovecot and Postfix to authenticate against a LDAP server, such as Fedora Directory Server or OpenLDAP. This is a huge operation.
4. Protocols supported: SMTP and ESMTP for the MTA; POP, IMAP, POPs (Secure) and IMAPs (Secure) for mail client synchronisation.

Further enhancements

There are a lot of enhancements you can do to this set-up. Some of them are listed below:

1. Secure the server with SpamAssassin and ClamAV. SpamAssassin is a spam filter from Apache

Foundation, and ClamAV is an open source anti-virus. Please note, however, that scanning each mail against a gazillion rule files to find spam, and then scanning them against signatures and heuristic rules to find viruses and malware scripts, will take a humongous amount of processing power and slow the system down considerably. Here's a resource: postfixmail.com/blog/?p=360.

2. Install a Web mail interface. This one is fun. Most, if not all, Web mail apps use IMAP, so there're almost no disk space requirements on the Web mail-hosting Web server. Note, however, that CentOS' old version of PHP (5.1.6) means that no decent-looking Web mail app will run on it. I tested out RoundCube and @Mail Open. But, yes, there's always the tried-and-tested Squirely Mail, which more or less works under all circumstances.
3. Get yourself a directory server for central authentication, and configure Postfix and Dovecot to authenticate against them. You'll have an added advantage because you can actually get machines themselves to authenticate against LDAP, and you'll never need an `/etc/passwd` file again. I'll cover Fedora Directory Services at the end of the series, unless you people want it earlier, of course.

Next!

What will we do next? Let's see... How about a collaboration platform? Video conferencing, Internet Relay Chat, maybe Jabber, a groupware suite... yeah. That'll be it. And after that? How about a storage grid? With multiple low-powered machines handling about 50 to a 100 terabytes of Network-Attached Storage? Patience... 

Reference

How To Forge Perfect CentOS Server article: www.howtoforge.com/perfect-server-centos-5.3-x86_64-ispconfig-2-p5

By: Boudhayan Gupta

The author is a 14-year-old student studying in Class 8. He is a logician (as opposed to a magician), a great supporter of Free Software and loves hacking Linux. Other than that, he is an experienced programmer in BASIC and can also program in C++, Python and Assembly (NASM Syntax).

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Vim Editor Essentials

Vim (Vi Improved) is a text editor that is one of the direct derivatives, and one of the prime ingredients of the UNIX hacker culture. With its extensive support and simplicity, Vim stands out as a unique text editor with numerous features. It's both simple and powerful!

We come across numerous GUI text editors like KWrite and Gedit, with which you need to use the mouse extensively to access some of the features. Unlike these, Vim doesn't support the mouse. Instead, it stays close to the command-line with extensive key-bindings support. Many believe this is a feature, because it facilitates better control over text processing with simple commands.

This article will focus on how Vim can help get going with your text editing tasks. If you are new to Vim, open a terminal session and type the following command:

```
$ vim test.txt
```

This will launch the editor. Press 'i' and start writing. You might feel a bit awkward at this stage since you are more comfortable with GUI text editors and probably might think: what's the point? Well, Vim has its many advantages. Let's create a large file using the *dd* command,

filled with 0s. Now open that file in GUI editors like Gedit or KWrite. What happens? It takes a lot of time to render the text, and eventually crashes, right? Now, try to open it with Vim, and see the difference.

Let us have a roundup of the treasures of Vim:

- Mode-controlled text editing
- Regular expressions support
- Text replacement, searching, deletion
- Auto completion
- Auto indentation
- Split windows
- Multiple file tabs
- Syntax colouring
- Dictionary
- Better help
- Sleek and simple

Installing Vim

On most of the distros, Vim is installed by default. However, if you're on an Ubuntu system like me, you'll need to download a few extra packages to get the full functionality.

Open a terminal and run the following command:

```
$ apt-get install vim-full.
```

Time to get started now. Open a terminal and type the command given below:

```
$ vim
```

You'll see something similar to the screenshot in Figure 1.

To open or create a new file, type...

```
$ vim filepath
```

Vim opens in the command mode where it accepts Vim commands only. To edit the text, press 'i' to switch to *Insert* mode. Now you can type text. The cursor can be moved using standard keyboard arrows or using the keys given in Figure 2.

To exit from the Vim editing mode, press ESC. Now, to save the changes to the file, type *:w*; to save and quit, type *:wq*; and to quit without saving changes, type *:q!*

Let's now look at some of the important operating modes of Vim.

Command mode: We can use different letters or letter sequences to command Vim operations. Vim commands are case sensitive. The ESC keystroke can terminate the command.

Insert mode: When the editor is in *Insert* mode, on the footer part you will see the '-- INSERT --' status. To switch back to command mode, press ESC. Text can be inserted in this mode. Press 'i' to initiate *Insert* mode. It is possible to initiate *Insert* at different portions of the text. To insert at the next new line, press 'o'; to insert at the new line before the current one, press 'O'; and to insert at the end of the line, press 'A'.

Command line mode: In command line mode, we use commands starting with '?' which will show commands that we're tying at the moment, at the footer part of the editor. For example, *:help*, *:wq*, etc.

Basic operations

To open and save files

To open files with Vim, use the following command: *vim file*. To open multiple files as split windows, type: *\$ vim -O file1 file2*. To open a file from the Vim command-line, use the following: *:e file* // Auto complete is supported by pressing TAB.

To save the changes to the currently opened file, press ESC to switch to the command mode from the editing mode, then type *:w* and press ENTER. To exit Vim after saving a file, type *:wq*. To just quit without saving, use *:q!* To save the current file as a new file, use the command line *:w new_filepath*.

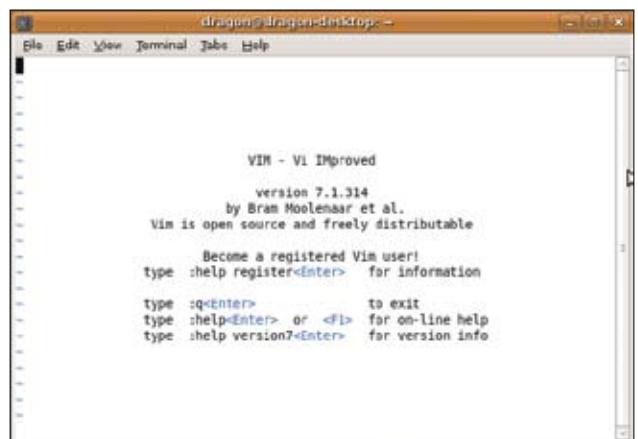


Figure 1: The Vim editor



Figure 2: Cursor navigation

Manipulating files

Cut, *copy* and *paste* are essential features of any text editor. To cut the current word, place the cursor at the starting character of the word and use 'cw'. To cut the current line, use 'cc' in the command mode. To copy the current word, place the cursor at the starting letter and use 'yw', while to copy an entire line, use 'yy'. To paste content, place the cursor at the position where the contents of the buffer need to be placed, and press 'p'.

To remove a word, place the cursor at the starting letter of the word, and press 'dw', while to remove a line, press 'dd', and to remove a character, press 'x'. To undo the previous action, press 'u', while to redo an action, 'Ctrl + r'. To repeat a previously performed task, press '.'. To list the available *undo tasks*, ':undolist'.

To search, substitute and replace

To search for a word/sentence while in the command mode, type */word* and press ENTER, where 'word' is the word you're searching for. To repeat the search in the forward direction, press *n*, while to reverse the direction of the search, press *?*.

To replace a part of the text, use:

- *:%s/word_pattern/replacement_text/* – replaces

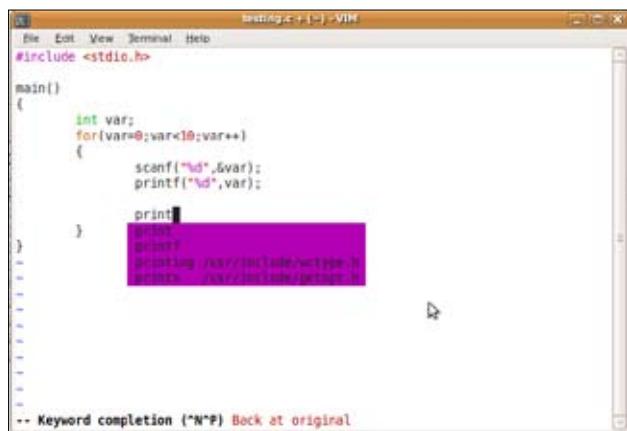


Figure 3: Auto completion in Vim

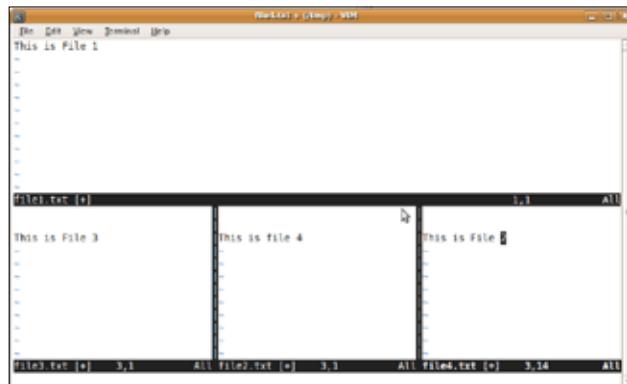


Figure 4: Using multiple files side-by-side

- the first word of every line
- `:%s/word_pattern/replacement_text/` – global replacement of the word
- `:%s/word_pattern/replacement_text/gc` – replacement with interactive Yes/No confirmation

%s represents the entire text in the file. It is also possible to use a range of lines for replacement. In case we want to use a replacement only between the lines 1 and 25, the above command can be used as:

```
:1,25 s/word_pattern/replacement_text/
```

You can also use regular expressions for replacement and searching. This is similar to the *sed* (stream editor) syntax.

Repeating commands *N* times

If you want to repeat a specific command *N* number of times, prefix the number of times before the command. For example, to copy the next five lines, use `5yy`, where `yy` is the command for copying 1 line. To move the cursor to the eighth word of a line, use `'8w'`.

Selecting text

Vim has an awesome option to select a portion of text, just as we do using a mouse in GUI-based editors. The special purpose option is called Visual Mode.

Press 'v' in the command mode and navigate the cursor—the selected text will be highlighted. After making the necessary selection, press a command for an operation.

For example, press 'v', and make selections by moving the cursor down and right. For deletion, press 'd', or any other required operation.

Advanced Vim features

Vim is an advanced editor that has capabilities like spell check, auto indentation for different programming languages, auto-completion, syntax colouring and more. Syntax colouring and auto indentation enables programmers to write code in an artistic way, making the code more pleasing to the eye. Vim also supports colouring schemes with themes.

Syntax colours and auto indent

To enable syntax colouring, use the command line :
syntax on.

Vim supports many programming languages for indentation. To enable indentation, use the command line, `:set autoindent`. To explicitly enable C syntax indentation, use `:set cindent`.

Spell check and auto complete

Vim also supports spell checking. It highlights wrongly spelled words with a different colour. To enable spell checking, at the command line, use `:setlocal spell spelllang=en_us`, for US English while writing a document.

For auto completion of a word or a keyword, type a part of the word and press *Ctrl+N*, after which a pop-up will show the list of available words (Figure 3). You can scroll through the word list by pressing *Ctrl+N* repeatedly. Auto completion works for words that have already been typed previously in the current file.

Install the *ctags* package if you want inbuilt auto-completion support for various programming languages as well.

Split windows

There are certain occasions when you need to work with multiple files simultaneously. Normally when you want to refer to the contents of a file while working on another file, you open two instances of editors side-by-side. But Vim is intelligent enough to open multiple files simultaneously.

To start a horizontal window by splitting the current Vim instance, use the command `Ctrl+w+s`, or at the command line, use `:split`. For a vertical split, type `Ctrl+w+h`, or at the command line, `:vsplit`. Refer to Figure 4. You can now switch between different split instances using the `Ctrl+w+w` shortcut. These multiple splits can be further split using the same commands. The split windows act as separate instances of Vim so that we can

open and work on different files, side by side.

To exit from a split window, use the **Ctrl+w+q** shortcut, or at the command line, use **:q!**

While we're on the subject of split windows, there is a command called **vimdiff** for viewing the difference between two files. Suppose you have two versions of a text file, and you want to look at the changes made and compare it with the original, use the command:

```
$ vimdiff file1 file2
```

When you scroll through the file, both file instances will be scrolled. Sounds interesting, right? Take a look at Figure 5.

Vim also supports window tabs. To open a new tab, at the command line, use **:tabnew**. Now to switch between tabs, use the **Ctrl+PAGEDOWN** or **Ctrl+PAGEUP** shortcuts.

Line numbers

In certain cases, especially while writing code or editing a script, it is convenient to see line numbers for the text file. To enable line numbers, use the command **:set number**. To disable the function, use **:set nonumber**.

Execute external commands

While working from Vim itself, you can execute external commands. To execute and view the output of a command, at the command line, use **:!command**, where 'command' is the command you want to execute. For example, to execute ls, try **:!ls**

It is also possible to paste the output of the executed command to the currently working file by using **:r !command**. For example, **:r !ls**

Vim has awesome features to process the contents of the file using external commands and to paste the output back to the file. It is also able to process text between a range of lines.

There are situations when a part of the text needs to be processed. Vim makes it convenient to process a given range of lines using external commands.

tr is a utility to perform translations based on the sequence inputs. We can easily perform translations such as lower case to upper case conversion using **tr** as the following bash command line.

```
slynx@slinux-laptop:~$ echo "This is a line of text 1234" | tr 'a-z' 'A-Z'  
THIS IS A LINE OF TEXT 123
```

Suppose we have a large text file and the text between the lines 3-5 is to be converted to upper case. We can perform it easily using the external commands methodology like **:3,5 !tr 'a-z' 'A-Z'**,

which instructs Vim to perform **tr 'a-z' 'A-Z'** for the text between the lines 3-5.

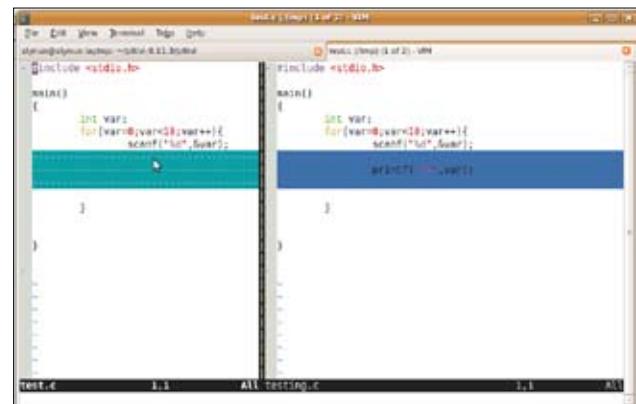


Figure 5: Files opened using the vimdiff command

In this way, any kind of external command can be coupled with Vim to process any part of the text in a file, in a handy way.

Moving the cursor in a file

Vim enables moving the cursor to different positions by accepting different references. For programming tasks, often compile/runtime errors occur and compiler return errors are noticed with line numbers. In such cases, we need to move the cursor immediately to the error line referenced by the line number. To move to a line referenced by a line number, use **:line_number**. For example, to move to line 50 use **:50**

Essentially, we can also perform some actions using the corresponding commands:

- Move cursor to beginning of line – **0**
- Move cursor to end of line – **\$**
- Move cursor to beginning of next line – **+**
- Move cursor to end of file – **G**

Scrolling page by page is very useful while dealing with large files. To do so, use **Ctrl+f** for forward scroll and **Ctrl+b** for backward scroll.

Getting help

Vim has an embedded command line called **:help** to get help with different operations. For more information on making substitutions, use **:help substitutions**; for search, use **:help search** and so on. To quit from help mode, use **:q**

If you would like more insights into the Vim editor, I would like to recommend *A byte of Vim* written by Swaroop C H [www.swaroopch.com/notes/Vim]. I guess that's all for now. Hope you will join our Vim club soon. Happy hacking, till we meet again!  

By: Sarath Lakshman

The author is a Hacktivist of Free and Open Source Software from Kerala. He loves working on the GNU/Linux environment and contributes to the PiTiVi video editor project. He is also the developer of SLYNUX, a distro for newbies. He blogs at www.sarathlakshman.info

Audit Network Device Configurations

Introducing Nipper, a tool that enables network administrators, security professionals and auditors to quickly produce reports on key network infrastructure devices.

*I*t's no secret that in order to ensure the protection of your network perimeters, network devices must be audited regularly.

Securing your network from attackers must be driven by security assessments done externally and internally. While assessing the security posture of your network internally, you could take the following steps:

1. Interview network and security administrators to understand the current network set-up
2. Review network and routing rules

3. Review systems configuration for adherence to hardening guidelines
4. Review remotely managed security controls
5. Review logging facilities

The effort required for this security review of network devices will depend on the number of devices in scope of the review, the types of devices (routers, switches and firewalls) and the number of rules configured to run this device.

For example, if you have around 20 network devices (namely routers, switches and firewalls) and have to perform a security configuration review, it will take large amounts of time to go through each line of configuration and complete the exercise. During a manual review, it is quite possible that the auditor could miss/skip some rules. To avoid defects in the report, one should also involve a tool-based approach to audit devices. Nipper is one such open source tool that can parse network device configuration files and carry out a security review of devices.



Note: RAT (Router Audit Tool) is a

network device

configuration audit tool from CIS (Centre for Internet Security—www.cisecurity.org/bench_cisco.html). This tool only works for Cisco IOS and PIX firewalls. In this article we will discuss Nipper, which can cover many networking devices from various vendors.

The following are the devices that



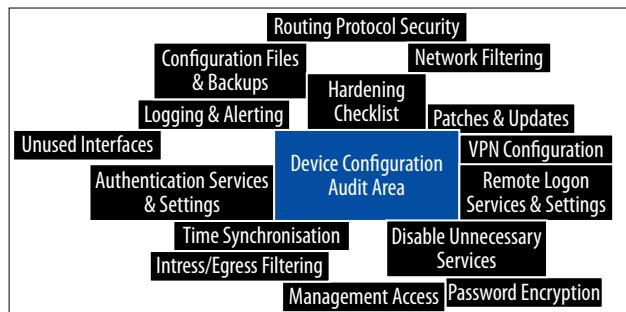


Figure 1: Network device audit area



Figure 2: Sample Nipper HTML report

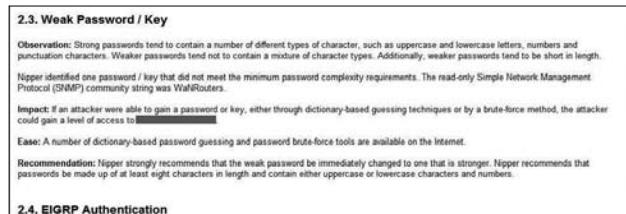


Figure 3: Sample of Nipper-generated report

Nipper supports:

1. Firewall (3Com, Checkpoint, Cisco, Juniper, Nokia IP, SonicWALL, Nortel)
2. Router (Cisco, Bay Network, Nortel)
3. Switches (Cisco, 3Com, HP ProCurve, Nortel)

Table 1 lists the devices and command switches that must be provided while running Nipper.

In order to carry out a network device security audit, Nipper checks the following items in a configuration file:

- Protocols in use
- Routing configuration
- Authentication and password
- Login, log-on banners and timeouts
- Operating system versions
- Logging
- Encryption/encoding
- Network filtering
- Time synchronisation
- Console/VLAN/VPN configuration



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Installing Nipper

Nipper is available for both the Linux and Windows platform. It can be downloaded from nipper.titania.co.uk/downloads.php. For Windows, it's quite straightforward. Download the zip file containing the Nipper executable, extract all contents and use the command prompt to execute *nipper.exe*.

Installing it on Linux is also simple. Two packages are required on Linux: *libnipper* and *nipper-cli*. Download the source code and follow the steps mentioned on nipper.titania.co.uk/install.php. The steps to install from source:

1. Download and extract.
2. Create a *build* directory in the source code directory
3. Run the *cmake* command in the *build* directory
4. Run *make* and *make install*

Alternatively, you can use the BackTrack Live CD to use Nipper without the requirement for a local installation.

Getting started

To begin with, you need to provide the network device configuration file as the input to Nipper. The tool then parses this file and analyses each Access Control List (ACL) and Access Control Entries (ACE). Shown below is the sample output displaying Nipper running on the BackTrack LiveCD:

```
bt nipper # nipper --ios-router --input=router.conf --output=ciscoreport.html
bt nipper #
```

Nipper is capable of exporting reports in HTML (default), XML, Latex and ASCII text report formats. Figure

Device and command switches	
Device Type	CLI Option
Checkpoint VPN-1/Firewall-1	--fw1
Bay Networks Accelar	--accelar
Cisco Catalysts (IOS)	--ios-catalyst
Cisco Catalyst (NMP/CatOS):	
i) NMP based catalyst	--nmp
ii) CatOS based catalyst	--catos
Cisco CSS	--css
Cisco Routers (IOS)	--ios-router
Cisco Security Appliances (ASA / PIX / FWSM)	
i) Cisco ASA Security Appliance	--asa
ii) Cisco PIX Security Appliance	--pix
iii) Cisco FWSM Security Appliance	--fws
Juniper NetScreen Firewalls	--screenos
Nokia IP Firewalls	--nokia
Nortel Passport	--passport
SonicWALL SonicOS Firewall	--sonicos

Table 1

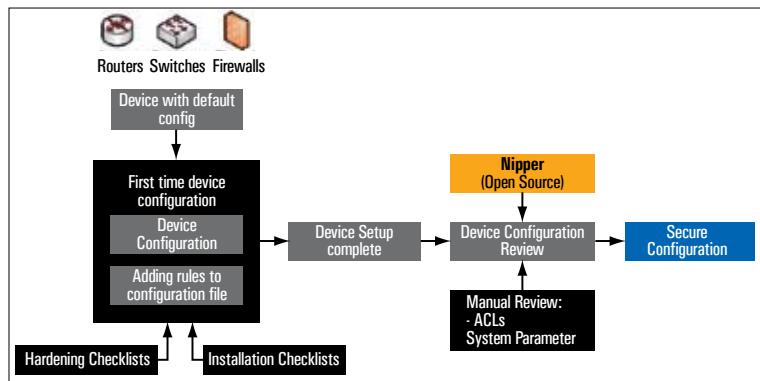


Figure 4: Best practices for a network device review

2 shows a sample of an HTML report output. Command line options for selecting a report format are as follows:

- *--html* for an HTML report format
- *--xml* for an XML report format
- *--latex* for a LaTeX report format
- *--text* for a typical ASCII text report format

As you're aware by now, Nipper exists to report vulnerabilities in network configurations. As part of this reporting, Nipper includes the following sections: observations made during audit, the impact of a security weakness, ease of carrying out the attack, and recommendations to remove the security weaknesses. A sample report is shown in Figure 3.

Best practices

Before we close for now, here are some of the best practices that should be followed in your current IT set-up to ensure a secure network perimeter:

1. Develop a security/hardening checklist for each vendor product. Ensure that it is referred to before a device is installed.
2. Device roll-out to production must happen through a change/IT request. The security team should validate device hardening with Nipper, while going through a manual review of ACLs for that particular set-up.
3. Track security notifications for network products that are installed on the network.
4. Network security reviews and audits must be conducted on a frequent basis by external network security consultants.

Figure 4 represents the best practices for a network review. Of course, there's more to be said here, but I'll leave it to you to test Nipper and find out how suitable it is for your network auditing requirements. Point your browser to nipper.titania.co.uk to get started.



By: Rajinder Singh

The author is an information security consultant at TCS. A penetration tester by profession, he has been using Linux since 2002.



Automating UNIX Administration

A Puppet show can turn out to be real entertainment for UNIX administrators.

*I*n the UNIX operating system everything is a file, which makes it an easy-to-manage and administrator-friendly system. The traditional way of managing UNIX was to use the telnet interface, but being a plain-text protocol, telnet exposes you to the risk of network snooping and compromise of login credentials. SSH works on an encrypted channel to overcome the snooping issues. A UNIX administrator can SSH into the box from a remote machine and change the configuration or execute commands remotely.

Generally, it is considered a good practice to take a configuration backup before making any changes to the production configuration so that the old configuration is available for roll-back. Also, as a part of the organisation's policy, the same base configuration should be configured on all the servers to reflect consistency and as a server-hardening practice. A majority of the

problems in the UNIX environment occur due to ad-hoc changes, which can be mitigated by following proper change management procedures. Handling and monitoring ad-hoc changes, and restoring the previous state, remains a challenge for organisations.

Meeting such challenges is quite workable for a small set-up of 1-20 servers and a dedicated UNIX administration. But during hardware failure or other problems, where the servers need to be reconfigured from scratch, it takes a lot of effort and time in restoring the servers to the previous state. To handle such scenarios, a quick solution would be to hire another UNIX administrator who could act as a secondary resource and offloads other activities from the primary resource during disaster conditions.

Think about a scenario of managing a globally-distributed data centre with 500 *NIX servers or more, comprising Solaris, Debian, Ubuntu, Fedora, CentOS, etc. Here, servers

are running with the same base configuration and packages, where configuration files need to be checked-out to a version-controlled repository. Only planned changes are allowed and the previous configuration state is restored for unplanned changes. Additionally, centralised user and policy management, along with automated configuration recovery during disaster conditions are required. In such a case, building a team of 10-20 administrators would not be a recommended approach. Rather, using a centralised configuration tool to automate the administration tasks would be a better option to follow.

Along with commercial tools like BladeLogic and OpsWare, there are a couple of open source systems automation and configuration management tools available like Bcfg2, Cfengine and Puppet. Cfengine has been an administrator's favourite configuration management framework since the past few years and is widely being used by many companies. Puppet turns out to be a next-generation configuration management tool to overcome many of Cfengine's weaknesses.

Puppet is written in Ruby and is released under the GPL. It supports a number of operating systems like CentOS, Debian, FreeBSD, Gentoo, OpenBSD, Solaris, SuSE Linux, Ubuntu, etc. Puppet is being used by many organisations including Google, which uses it to manage all Mac desktops, laptops and Linux clients. A list of other Puppet users can be fetched from reductivelabs.com/trac/puppet/wiki/WhosUsingPuppet

Puppet installation

Puppet installation is fairly easy and is, in fact, a matter of seconds. Puppet runs in client-server configuration, where the client polls the server at port 8140 every 30 minutes to check for the new instructions or to match the configuration files. The client also listens to a port to have push-updates from the server. In Puppet terminology, a client is called a Puppet node and a server is called a Puppet master. Figure 1 shows the set-up.

The following few steps demonstrate the installation steps for the CentOS operating system—a similar approach can be followed for other supported systems:

On the server side:

1. Define the hostname for server as *puppet.domain.com*
2. Puppet can be installed using *yum*, but packages are not part of the default CentOS repositories or installation DVD. Even though it is available at DAG's repository, the versions are outdated. The best repository for Puppet is EPEL (Extra Packages for Enterprise Linux—see fedoraproject.org/wiki/EPEL). Puppet RPMs can either be directly downloaded and installed, or the *yum* repository can be configured to do the job. To use the EPEL repository, run the following command as a root user:

```
rpm -Uvh http://download.fedoraproject.org/pub/epel/5/i386/epel-release-5-3.noarch.rpm
```

3. Now install the Puppet server by issuing the following command:

```
yum install puppet-server
```

4. Install *ruby-rdoc* to enable Puppet command line help:

```
yum install ruby-rdoc
```

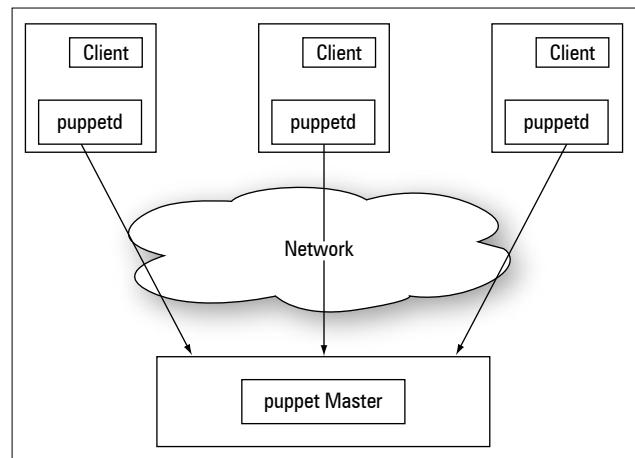


Figure 1: A typical Puppet set-up

5. Now, create a sample manifest file to start the Puppet server. This is just a test manifest and more complex manifests can be created using this tool, which will be demonstrated later. Put the following contents into the file using Vim or any other text editor. The purpose here is to create */tmp/testfile* on a node (puppet client) if it doesn't exist:

```

class test_class {
    file { "/tmp/testfile":
        ensure => present,
        mode  => 644,
        owner => root,
        group => root
    }
}

node puppetclient {
    include test_class
}

```

In the above content, the upper section defines a class named *test_class* that ensures that */tmp/testfile* with the defined permission is present on the client where the class will be included. In the lower section, client *puppetclient* includes the *test_class* and Puppet will create the file with the set permission on *puppetclient* if it doesn't already exist. Once done, start the Puppet server using the following command:

```
service puppetmaster start
```

6. The Puppet server is now installed and configured to listen to incoming connections from agents. Default installation comes with Webrick, which is not a good Web server to handle loads from a higher number of Puppet agents. Apache and Mongrel can solve this problem. Refer to the Puppet wiki for instructions on configuring Puppet with Mongrel.

On the client side:

1. Define the hostname for the server as *puppetclient.domain.com*
2. Configure the EPEL repository using the following command again:

```
rpm -Uvh http://download.fedoraproject.org/pub/epel/5/i386/epel-release-5-3.noarch.rpm
3. Install puppet and ruby-rdoc:
```

```
yum install puppet ruby-rdoc
```

This completes installation of the Puppet server and client.

Before proceeding further, make sure that the systems timing for the Puppet server and client are in sync. Now, from the client, issue the following command to get approval from the server as its subscriber:

```
puppetd --verbose --server puppet.domain.com
```

This will display the following output:

```
info: Creating a new certificate request for puppetclient.torridnetworks.com
info: Creating a new SSL key at /var/lib/puppet/ssl/private_keys/
puppetclient.domain.com.pem
```

In the above command, the client has raised a request to the server to be registered as a subscriber. Now, the server needs to approve the subscriptions. To view the pending subscriptions, issue the following command on the server:

```
puppetca -list
```

The above command will give the name of the node that needs to be approved or signed by the server. In the next command, sign that node:

```
puppetca -s puppetclient.domain.com
```

Once the client is approved by the server, the class assigned to the client will be executed. In this case, a file */tmp/testfile* will be created on *puppetclient.domain.com*. If the created file is deleted, it will be recreated on the next polling, i.e., within the next 30 minutes.

Once the basic Puppet infrastructure is ready, different classes can be created to accomplish different tasks.

Some sample Puppet classes

Below are a few sample classes for quick reference.

Sample 1: To install Apache and run the *httpd* service:

```
class apache {
  package { httpd: ensure => installed }
  service { "httpd":
    ensure => running,
    require => Package["httpd"],
  }
}
```

Sample 2: To stop the *mdmfp* service:

```
class redhat {
  service {
    "mdmfp":
      enable => true,
      ensure => stopped,
  }
}
```

Sample 3: To execute commands:

```
class start_vhost {
  $noop = true
  exec { "/usr/sbin/start_ws": }
  exec { "/usr/sbin/start_vhost": }
```

}

Sample 4: To start a service as per the remote operating system:

```
class httpd_service_start {
  case $operatingsystem {
    redhat: { service { "httpd": ensure => running } }
    debian: { service { "apache": ensure => running } }
    default: { service { "apache2": ensure => running } }
  }
}
```

Sample 5: To create a user:

```
class virt_users {
  @user { "jsmith":
    ensure => "present",
    uid => "507",
    gid => "507",
    comment => "John Smith",
    home => "/nfs/HR/home/jsmith",
    shell => "/bin/bash",
  }
}
```

Sample 6: To manage Cron job:

```
class set_cron_syscheck {
  cron { "syscheck":
    command => "/usr/bin/syscheck",
    user => "root",
    hour => "18",
    minute => "0"
  }
}
```

Sample 7: Transferring a file from the Puppet server:

```
class httpd_conf{
  file { "httpd.conf":
    source => "puppet://puppetmaster/httpd/conf/httpd.conf"
  }
}
```

Of course, much more detailed manifests can be created to manage multiple servers with heterogeneous UNIX operating systems. Subversion can be configured with Puppet to store configuration files and track changes, so that the changes can be reverted to a previous state.

Reporting is one of the important aspects of a configuration management system. Reporting from a configuration management system can provide information on performance and compliance to policies and standards. Puppet's reporting engine is limited at this stage, but still allows some useful basic reporting that can be graphed and displayed.

So, all in all, Puppet can be a real boost for UNIX administrators. 

By: Dhruv Soi

The author is the founder and principal consultant at Torrid Networks Pvt Ltd, and chairs OWASP India. Torrid specialises in information security and open source consulting services. OWASP is a worldwide free and open community focused on improving the security of application software. Dhruv can be reached at dhruv.soi@torridnetworks.com

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Post: Sr. Wintel Support- RIM
Company: Fidelity Information Services
Profile: Advanced system administrator skills focused on Microsoft operating systems (Windows 2000, and Windows 2003) are desired. Experience with one or more commercial UNIX flavors (Solaris, AIX) or open source (Linux, FreeBSD) platforms a plus.
Exp: 4-6
Location: Chennai
Email: Ranjan.Chakraborty@fnis.com

Post: Sr. Implementation Engineer
Company: Connectiva Systems(I) Pvt. Ltd.
Profile: Working Knowledge of conducting User Acceptance Test will be desired. Hands on experience in Oracle and Unix/ Solaris/ Linux is desired plus an experience in PL / SQL Programming & Shell programming.
Exp: 5-8
Location: Kolkata
Email: sgoswami@connectivasytems.com

Post: Teradata DBA
Company: Collabera
Profile: Responsibilities: Design and Architecture, Logical/ Physical Data Modeling, Dimensional Modeling, Participate in projects as the database resource. Experience with MP-RAS Unix and Linux operating systems is desired.
Exp: 5-10
Location: Bangalore
Email: nikita.subraya@collabera.com

Post: Unix System Administrator
Company: Verinon Technology Solutions Pvt. Ltd.
Profile: Must have 8-10years of Unix systems engineering and administration experience. Should be comfortable with all aspects of operating system administration for example, configuration of mail systems, system installation and configuration, printer systems, fundamentals of security, installing third-party software.
Exp: 8-10, **Location:** Gurgaon
Email: praveena.nellore@verinon.com

Post: Backend engineer
Company: Naksha Technologies India Pvt. Ltd.
Profile: Deep knowledge in Backend/ layout. Will be required to participate in backend design of Large SOC chip, Chip placement & timing optimization. Expertise with one or more of scripting languages such as Perl/ TCL/ Python/ Shell is a must. Must be very proficient working on Linux/ Unix based environments.
Exp: 5-10, **Location:** Hyderabad
Email: careers@nakshatechnologies.com

Post: Development Manager
Company: Informatica Business Solutions Pvt. Ltd.
Profile: BS/ MS/ Ph.D in Computer Science with 10+ years of IT experience, preferably in R&D plus strong experience in JAVA, J2EE and other programming languages. Knowledge of multiple operating systems (Windows & Unix-Solaris, HP/ UX, AIX, Linux) and principles of writing portable code is desired
Exp: 10-13
Location: Bangalore
Email: svaidyanathan@informatica.com

Post: Sr. Release Engineer - Build and Release, Maven
Company: First Indian Corporation Pvt. Ltd.
Profile: Experience with Java-based applications in a build creation, packaging, or implementation capacity. Should have an exposure to relational DBMS, with SQL experience being very helpful.
Exp: 4-8
Location: Bangalore
Email: msonia@firstam.com

Post: Project Manager- Web Applications
Company: Compare Infobase Ltd.
Profile: Knowledge in systems management and project management and technical competence in Database and Unix / Linux administration is desired. Candidate must be BE / MCA / B.Tech, and preferably with management background.
Exp: 8-10, **Location:** Delhi
Email: sangeeta@infobase.in

Post: Embedded Professionals- Architect
Company: Xavient Information Services
Profile: Will be responsible for coordination between offshore & onsite, providing solutions & design & develop applications.
Exp: 6-11, **Location:** Noida
Email: humanresource@xavient.com

Post: Solution Architect- Remedy
Company: Ericsson India Pvt. Ltd.
Profile: Exposure to work with International Customers, face-to-face dialog with Customers is desired plus good hands-on experience on Oracle Application Server, PL/SQL, JDBC. Working knowledge on UNIX OS such as HP-UX, Solaris, Linux & Scripting like Perl, Ksh is essential.
Exp: 9-14, **Location:** Gurgaon
Email: vikram.verma@ericsson.com

Post: Telecom developer- TCAP & protocol stacks
Company: Aries Information Systems Pvt. Ltd.
Profile: Telecom development experience specifically good in protocols such as TCAP & protocol stacks (SS7 - MTP3, SCCP, ISUP, TUP, IUP SIP), Call setup & processing, Billing system etc.
Exp: 5-10, **Location:** Chennai
Email: kevin@aries-inc.com

Post: Java, J2ee Technical Architect
Company: Object Frontier Software Pvt. Ltd.
Profile: Technical architect experience plus an experience in handling J2EE product development is desired. Should possess a Bachelor's or Master's degree in IT/Comp Science or related field. Hands on experience on Linux/UNIX environments will be preferred.
Exp: 6-11, **Location:** Chennai
Email: naveenkumarb@object-frontier.com

Post: Technical Manager
Company: WOW Global India Pvt. Ltd.
Profile: Experience in citrix, vmware, veritas is desired. Certification is must in any windows, linux, unix, solaris. Japanese speaking is must.
Exp: 6-10
Location: Bangalore
Email: resourcing@wowglobal.com

Post: Java Server Developers
Company: Objectwin Technology India Pvt. Ltd.
Profile: Strong and proven experience in developing server components is desired. Should be Strong in J2EE server technologies: Web Services, Object Model, Core Java, XML, Enterprise Java Beans, JMS. Must be good in Java/J2EE hands.
Exp: 4-8
Location: Mumbai
Email: nagendra@objectwin.com

Post: Team Lead
Company: Alcatel-Lucent Technologies India Pvt. Ltd.
Profile: Should be Strong in Layer 2/ Layer 3 areas. (Switch, Bridge, IP protocol, Multicasting, Routing protocols IGMP, RIP, OSPF, BGP). Good working experience in RTOS (Embedded Linux, Unix, Solaris), written code with Kernel APIs is also desired.
Exp: 7-8
Location: Chennai
Email: vijay.lakshmanan@alcatel-lucent.com

Post: Sr. R&D Engineer
Company: Synopsys
Profile: Must have significant prior experience writing pthreads, C, C++ and distributed debugging. Must be able to design and develop memory and IO efficient solutions for massively data intensive applications. Hands on experience in Linux environment (shell scripting, perl/tcl/python) is also desired.
Exp: 5-9
Location: Bangalore
Email: akshatc@synopsys.com

Post: Production Application Support Engineer
Company: Megasoft Ltd.
Profile: Should be BS in Computer Science or equivalent discipline required plus proficiency with Microsoft Operating Systems, including NT 4.0, WINDOWS 2000 and Server 2003 required. Familiarity with Linux (Red Hat) and Unix Operating System preferred.
Exp: 4-8
Location: Hyderabad
Email: rakeshn@xius-bcgi.com

Post: IT Security Consultant
Company: Verinon Technology Solutions Pvt. Ltd.
Profile: Responsibilities: to Interact with software providers in enforcing adequate levels of support to the installed inventory, discusses functionality and requirements that best meet the interests of ISG.
Exp: 4-6, **Location:** Saudi Arabia
Email: subrahmanyavarma@verinon.com

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Tried ZFS on Linux ?

ZFS is a revolutionary filesystem from Solaris with features miles ahead of ext3, the most-used filesystem under Linux. However, licence incompatibility makes it impossible to merge this open source filesystem to Linux. This article tells us how to use ZFS on FUSE, a tool that enables you to run ZFS on Linux—legally.

*J*eff Bonwick, the leader of the team at Sun Microsystems that developed ZFS, called it "...the last word in filesystems." It is indeed worthy of the praise considering its advanced yet easily maintainable features. ZFS, a pseudo-acronym for what was earlier called Zettabyte Filesystem, is a 128-bit filesystem, as opposed to the presently available 64-bits filesystems like ext4 and others.

Some of its excellent features include:

- **Simplified administration:** ZFS has a well-planned hierarchical structure with the uberblock (parent of all blocks) and disk label at the top, followed by pool-wide metadata, the filesystem's metadata, directories and files. The uberblock checksum is used as the digital signature for the entire filesystem. Besides property inheritance (utilising the hierarchical structure), ZFS provides auto management of mounting, sharing, compressions, ACLs, quotas and reservations, etc, making administration easier and more effective.

The filesystems in ZFS can be compared to directories in ordinary filesystems like ext3, and most administration tasks are done using just two commands—*zfs* and *zpool*.

- **Pooled storage:** ZFS has revolutionised the filesystem implementation and its management with the introduction of storage pools. Concepts like datasets (a generic term for volumes, filesystems, snapshots and clones) and pools (a large storage area available for the datasets) make filesystem handling easier for the administrator. Like the virtual memory model for a process, the filesystem can grow its usage space as required without any pre-determined space limits unless provided as 'quotas' within the pool model. 'Quotas' can be set, changed or removed at will. Also, a minimum 'reservation' space for each filesystem can be specified. One important aspect of the storage pool is the removal of volume management architecture, thus reducing a lot of complexity for the administrator.

- Transactional paradigm:** ZFS being a transactional filesystem is guaranteed to be consistent according to its developers. Data management in ZFS uses copy on write semantics, which ensure that data is never overwritten, always maintaining an old reference to the data. A sequence of filesystem operations is either committed or ignored as a whole, thereby preventing any corruption to the filesystem due to power shortage or some other outage. This, in effect, removes the need for the `fsck` tool, the traditional filesystem check and repair tool.
- Scrubbing and self-healing:** Since data and even metadata is checksummed, data scrubbing (an operation that checks data integrity within a filesystem or, in other words, data validation) is performed easily within ZFS. Checksum algorithms can be any user-selected algorithm from SHA-256 to fletcher2, producing 256-bit long checksums. Besides checking for data integrity and preventing silent corruption, ZFS also provides mechanisms for self healing, mainly through RAID-Z and mirroring. Two RAID-Z variations, single and double-parity, are in fact slight variations of RAID-5 and RAID-6, respectively. The variations mainly aim to eliminate the write hole, solidifying data integrity. Besides, techniques like resilvering or resyncing help in replacing a corrupted or faulty device with a new one.
- Scalability:** The team behind ZFS made the decision to go for a 128-bit filesystem, even though 64-bit filesystems like ext4 have come up only recently. Its data limit is an enormous 256 quadrillion zettabytes of storage which, is almost an impossible limit to reach in the near future since fully populating a 128-bit storage pool would, literally, require more energy than boiling the oceans, as Bonwick pointed out. Directories can have up to 2^{48} (256 trillion)

entries. No limit exists on the number of filesystems or number of files that can be contained within a filesystem.

- Snapshots and clones:** Snapshot is a read-only copy of a filesystem or volume at any particular point of time. Its design is such that space is consumed only when data is changed, preventing any freeing of data from the filesystem unless explicitly asked, giving further options for maintaining data integrity. Clone is a writable filesystem generated from a snapshot. The creation of snapshots and clones in ZFS is very simple and is always pointed out as one of its big advantages.

ZFS and Linux

ZFS is the standard filesystem for Solaris/OpenSolaris OS whose source code is published under CDDL (Common Development and Distribution License). However, from the beginning (and hopefully forever) the Linux kernel has remained licensed under the GPLv2, which prevents any other code to be linked with the GPLv2 Linux kernel unless that code's licence is GPL v2 compatible. So the open sourced code of ZFS cannot be added/linked to the kernel code like any other filesystem, either as a part of the kernel or as kernel modules. As a workaround, some solutions pointed out by the open source community are:

1. A 'court ruling' (either in the US or EU, where ZFS is mainly used) stating that GPL and CDDL are compatible.
2. Either of the parties (Linux and Solaris) need to change the licence of their code to a mutually compatible one.
3. A GPLv2 ZFS reimplementation from scratch, which should be free from all the 56 patents that Sun has taken on ZFS code.
4. A method by which we would be able to implement ZFS to be usable for Linux, which is only possible through dynamic linking between the codes—this is allowed.



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The possibility of Options 1 and 2 are remote, compelling us to choose between Options 3 or 4. As a solution like that suggested in Option 3, a project named BTRFS, guided by Chris Mason at Oracle is under development, having been merged to a “rc” pre-release of the current Linux kernel (2.6.30), and is under testing. Definitely, this is going to take a long time as ZFS itself was under development for five years. Solution 4, which is through a utility called FUSE and seems the most stable option as of now, is what I am going to discuss as we go on.

FUSE

Filesystem in USERspace, or FUSE, helps implement a fully functional filesystem in a userspace program rather than directly in the kernel. It is implemented in OSs like Linux, FreeBSD, etc. Its components (as of version 2.7.4) consist of a FUSE kernel module, a FUSE library containing *libfuse* and *libulockmgr*, and a special file descriptor like a device file in Linux named */dev/fuse*, used for communication between the kernel module and the userspace library. For user convenience, a program named ‘fusermount’ is provided along with the FUSE package as an easy usermode tool to link up between the user-defined filesystem and the FUSE module.

ZFS on FUSE

ZFS on FUSE is a project under development by Ricardo Manuel da Silva Correia, a computer engineering student, and is sponsored by Google as part of Google Summer of Code 2006. So after completion of this project, ZFS will have a port on the FUSE framework, which effectively will mean operating systems like Linux can use ZFS. A rough performance comparison of ZFS on FUSE with NTFS-3G, XFS and JFS can be found at www.csamuel.org/2007/04/25/comparing-ntfs-3g-to-zfs-fuse-for-fuse-performance.

How it works

The *zfs-fuse* daemon acts like a server, managing ZFS on the system through the FUSE framework. Every filesystem operation on the mounted ZFS devices from any application will be through the standard C library system calls. This results in calling the kernel’s appropriate function from the virtual filesystem (VFS) interface, which will then be hooked to the FUSE module and, in turn, acts like a filesystem module through a special purpose device named */dev/fuse*. This device acts as a bridge between the ZFS implementation and *fuse* module. The *fuse* module communicates with the ZFS filesystem implementation (which in this case is *zfs-fuse*), through the FUSE library *libfuse* which has functions similar to that of VFS’s interface. The user program returns results for the filesystem request in the required format through the FUSE framework to the application.

Getting started

The latest source code of ZFS on FUSE can be downloaded from the project site—www.wizy.org/wiki/ZFS_on_FUSE.

It is available in two forms, as a release version packed as a bzip file or directly in source form from the Mercurial repository. Installing from the source requires that we use *scons* instead of *make*, though the command and options are almost the same for both. It’s better you read the README and INSTALL files in the source directory before proceeding. Besides, for certain distributions like Gentoo, Debian, Fedora, Ubuntu, etc, *zfs-fuse* is available via the regular package management system making the installation much easier. Please use your package manager and search for “zfs”.

Installation on Fedora 10

As I was using Fedora 10 while testing ZFS, my commands and configuration files are more specific to Fedora, though with minor variations the same should apply to most distros.

First install the *zfs-fuse* package using the command [all commands from here on should be executed as the root user, unless otherwise mentioned]:

```
yum install zfs-fuse
```

This installed *zfs-fuse* version 0.5 on my system that has Fedora 10.

Setting up ZFS

Before executing any commands, it should be verified that *zfs-fuse* daemon is running.

```
pgrep zfs-fuse
```

If it’s not, issue the following code:

```
service zfs-fuse start
```

...or directly run the script file as follows:

```
/etc/init.d/zfs-fuse start
```

Managing ZFS

After making sure that the *zfs-fuse* daemon is running, we need to have a ZFS pool comprising of one or more devices. We will create a pool, say ‘K7’, representing a group with many users, each having their own filesystems on ‘K7’. A user, say ‘ajc’, will have his own filesystem, which will be mounted under ‘K7’ with the same user name along with the required properties.

```
zpool create K7 sda10
```

This will create a pool named ‘K7’ using the */dev/sda10* device. You can also give the full path as */dev/sda10* instead of just *sda10*. However, it’s not required since *zfs-fuse* will search for any device by default in this directory. If the *-n* option is specified after *create*, then no pool will be created. This will cause just a dry-run, which ends up showing the layout of ZFS after the execution of that

command. By issuing the above command, we not only created a pool but also implicitly created a dataset (more specifically, a filesystem) too, which will be mounted by default at location '/K7'. It is important to avoid any pool name whose name clashes with directories under / [root directory]. However, if you want to explicitly specify the mount point, say at /mnt/k7 or elsewhere, then execute the following:

```
zpool create -m /mnt/k7 K7 sda10
```

...or if pool 'K7' already exists:

```
zfs set mountpoint=/mnt/k7 K7
```

However, after this, K7 won't be mounted anywhere. So we need to issue either auto mount on all filesystems by issuing the following command:

```
zfs mount -a
```

...or any specific filesystem as:

```
zfs mount K7
```

For unmounting we use the *unmount* option instead of *mount* in the above commands.

Also, at any point in time, if you want to list all the pools in your system, execute the command given below:

```
zpool list
```

The health status of the pool can be checked with the following:

```
zpool status
```

This command can take the optional arguments *-x* and *-v* for a quick overview and verbose status, respectively.

Since we have created a pool named 'K7' along with a filesystem with the same name and mounted it at /mnt/k7, to properly harvest the pool we may need more filesystems suitably named in the pool 'K7'. This can be achieved by using the dataset specific command *zfs* rather than the pool command *zpool*.

For example:

```
zfs create K7/ajc
```

...will create a filesystem mounted at a sub-directory 'ajc' in a directory where K7 is mounted, which in our case will be /mnt/k7/ajc. Similar to specifying mounting options for pools as mentioned above, filesystems also have options like:

```
zfs create -o mountpoint=/mnt/k7/ajc K7/ajc
```

Or if you want to change the mount point of an already created filesystem, use:

```
zfs set mountpoint=/mnt/k7/ajc K7/ajc
```

It is quite possible that after some time the space you allocated for the pool may run out. Using the in-built compression can be a temporary, yet ready-made solution for such a situation.

```
zfs set compression=on K7/ajc
```

Another way to tackle this is to add devices to the pool with the required device space, which will be added to the space already available.

```
zpool add K7 sda11
```

Also, as a counter operation to *add*, we also have *remove* to remove any added devices from the pool but with the restriction that removal can be performed only on hot spare (that is, inactive devices made active when the system is degraded) devices.

Like *mountpoint* and *compression*, many other properties of a filesystem like 'quota', 'reservation', etc, can also be set as:

```
zfs set quota=3G K7/ajc
zfs set reservation=1G K7/ajc
```

Properties of a filesystem can be viewed using *get* as follows:

```
zfs get quota K7/ajc
```

And to see all properties, issue the following command:

```
zfs get all K7/ajc
```

As mentioned earlier, ZFS gives a lot of importance to data validation, which is also called scrubbing, and this can be performed on any of the filesystems using the command *scrub*:

```
zpool scrub K7
```

If at any point you want to see all the commands you issued on pools, use:

```
zpool history
```

Or for a particular pool like K7, issue the following:

```
zpool history K7
```

Likewise, use *iostat* to get a count of I/O

operations on pools.

Now, for creating a snapshot of any filesystem, we can issue:

```
zfs snapshot K7@snap1
```

The snapshot of a filesystem is represented by its name followed by '@' and then the snapshot name. Use the **-r** option to create snapshots recursively on all filesystems under the specified filesystem, as in what's shown below:

```
zfs snapshot -r K7@snap2
```

Now, after a lot of changes to the filesystem, if you want to go back to a snapshot of the filesystem, issue the **rollback** command. The **-r** switch is required, as we have to remove the newer snapshot 'snap2' to roll back to 'snap1'.

```
zfs rollback -r K7@snap1
```

Or if the snapshot you are rolling back is the newest of all the snapshots of the filesystem, then use the following:

```
zfs rollback K7@snap2
```

As in the listing of pools, datasets (which include filesystems and snapshots) can be displayed using the command given below:

```
zfs list
```

The snapshot created can be easily transferred between pools or even between systems using the commands **send** and **recv**. The following command will create a new filesystem 'K7_snap' under 'K7' from the snapshot 'snap1':

```
zfs send K7@snap1 | zfs recv K7/K7_snap
```

The following command is the same as the one above, but the new filesystem and snapshot will be in a remote system 'sreejith':

```
zfs send K7@snap1 | ssh root@sreejith zfs recv K7/K7_snap
```

As we know, ZFS is the native filesystem of Solaris and if we want to migrate any pool storage in Solaris to some other OS like Linux, then we'll have to first export the pool from Solaris or whatever OS in which it was being used, and then import it to the required OS.

```
zpool export K7
```

In order to forcefully export 'K7', we can use the **-f**

switch with the above command.

The following command will display all importable pools with their name and ID:

```
zpool import
```

...and we can import it using the name (or even the ID), issuing the command below:

```
zpool import K7
```

And finally, the **destroy** command is used to destroy a pool or a filesystem. The following destroys the 'ajc' filesystem in 'K7':

```
zfs destroy K7/ajc
```

...while the next command destroys the K7 pool altogether:

```
zpool destroy K7
```

Though ZFS on FUSE manages to implement a lot of the features of native ZFS, it is still not complete, as has been pointed out in the status of the project. Since the implementation is in userspace, which has to be linked to the Linux kernel through the FUSE module, the performance and scalability is not at par with the kernel module implementation of other filesystems as of version 0.5. Even then, the project is a nice way to get acquainted with the revolutionary ZFS in operating systems like Linux. However, it is expected that a properly tuned ZFS on FUSE may have a comparable performance to the native filesystems as in the case of NTFS-3G, a freely and commercially available and supported fast handling read/write NTFS driver for Linux, FreeBSD, MacOS, etc.



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- blogs.sun.com/bonwick/entry/128_bit_storage_are_you

By: Anoop Joe Cyriac

He is currently working at K7 Computing, an information security solutions company. Hacking in GNU/Linux using C and Python is his passion. His areas of interest include virtualisation technologies and cloud computing. You can reach him at anoopjoeicyriac at gmail dot com.



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The Art of Guard

Last month we barely scratched the surface of the SELinux Targeted Policy that's shipped with RHEL 5. This month we'll try to delve deeper into its building blocks.

Part 3

*G*t has been an interesting journey for me ever since we started on "The Art of the Guard" series. I never imagined the kind of response it would elicit and I must thank the readers for their responses to the content and their queries. One request has been to include illustrations in the text since "...a picture paints a thousand words." I shall try to accommodate as many suggestions as I can. Unfortunately, this article also does not carry any illustrations, but I am positive that the subsequent ones will.

In the previous article we started exploring the Red Hat Targeted Policy as shipped with Red Hat Enterprise Linux 5. In Dan Walsh's words: "The Targeted Policy goal is to lock down all processes that listen for network connections and pretty much

all processes that start at boot. Processes that are started by a logged in user were unconfined (*unconfined_t*). Services started by the *init* scripts that did not have a policy were also run in an unconfined domain (*initrc_t*).

We also listed the users, roles and types that are inbuilt by default in the Red Hat Targeted Policy. Now, we shall explore some other building blocks of the Targeted Policy.

Booleans

Booleans, as we all know, are variables that can either be set as true or false. Booleans enhance the effect of SELinux policies by letting the system administrator fine tune a policy. A policy may protect a certain daemon or service by applying various access control rules. In real world scenarios, a system administrator would not like to implement all the access controls specified in the policy.

This is where Booleans help. Booleans create conditional access controls based on their value. As an example, the *httpd* (Apache Web Server) subject has the following Booleans in the targeted policy:

```
allow_httpd_mod_auth_pam
allow_httpd_bugzilla_script_anon_write
httpd_enable_ftp_server
allow_httpd_squid_script_anon_write
allow_httpd_anon_write
httpd_can_network_relay
httpd_disable_trans
httpd_tty_comm
httpd_unified
httpd_rotatelogs_disable_trans
httpd_builtin_scripting
httpd_enable_cgi
allow_httpd_nagios_script_anon_write
```



```
httpd_suexec_disable_trans
httpd_enable_homedirs
httpd_ssl_exec
allow_httpd_sys_script_anon_write
httpd_can_network_connect
httpd_can_network_connect_db
```

One of these Booleans is `httpd_enable_cgi`. As any Web administrator knows, CGI scripts can be potential security leaks—depending on the manner in which they are written and the use for which they are written. We frequently create Web servers that let people use CGI scripts to monitor and maintain our clients' mail server queues—to delete messages, hold messages, etc. A security breach can expose the entire mail queue leaving our mail server(s) vulnerable.

To prevent CGI scripts from running on a server that does not require them to be executed, simply disable the `httpd_enable_cgi` Boolean (set the value of this Boolean to `false`). SELinux Access Controls will deny execution of CGI scripts and thus secure the server.

Using the `seinfo` tool discussed earlier, you can list all the available Booleans by issuing the following command:

```
[root@vbg services]# seinfo -b
```

All the Booleans inbuilt in the SELinux Targeted Policy shall be displayed.

The list of Booleans in the currently loaded policy can also be retrieved by the `getsebool` command. The `-a` option not only lists all Booleans similar to the `seinfo -b` command discussed earlier, but also the current value of those Booleans.

```
[root@vbg services]# getsebool -a
```

```
NetworkManager_disable_trans --> off
allow_console_login --> off
allow_cvs_read_shadow --> off
allow_daemons_dump_core --> on
```

The above output shows various Booleans and their values. To get the value of a particular Boolean, it may be specified as an argument to the `getsebool` command. To view the current value of the `https_enable_cgi` Boolean, issue the following command:

```
[root@vbg services]# getsebool httpd_enable_cgi
httpd_enable_cgi --> on
```

A system administrator on a system not requiring CGI script execution would want to set this Boolean to `false` (off). To modify the value of this Boolean we can use either the `setsebool` or the `toggelsebool` commands.

To disable the `httpd_enable_cgi` Boolean, issue the following command:

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New Delhi-110019
Tel : +91-30880047/49
Email ID:
Info@fosteringlinux.com



```
[root@vbg services]# setsebool httpd_enable_cgi off
```

You can check the new value of the Boolean by again using the *getsebool* command described above:

```
[root@vbg services]# getsebool httpd_enable_cgi  
httpd_enable_cgi --> off
```

The above change will affect the Boolean value in the currently loaded policy but will not remain after reboot. To make Boolean values persistent across reboots, use the *-P* option with the *setsebool* command:

```
[root@vbg services]# setsebool -P httpd_enable_cgi off
```

This will ensure that value of the *httpd_enable_cgi* Boolean has been set to *off* and will not change even after reboot.

```
[root@vbg services]# togglesebool httpd_enable_cgi  
httpd_enable_cgi: active  
[root@vbg services]# getsebool httpd_enable_cgi  
httpd_enable_cgi --> on
```

A note of caution though—*togglesebool* only changes the “in memory” value of a Boolean. Changes made using the *togglesebool* command are not persistent across reboots.

As an exercise, I leave it to you to discover the Boolean that disables SELinux policy rules from applying to a particular service or daemon. In case of doubt, you can mail me for the answer.

Booleans also help to understand the various protected daemons under the SELinux Targeted Policy.

PortCon

PortCon or Port Security Contexts are similar to File Security Contexts, but are applied to Network Sockets or ports. In a SELinux policy, access to various ports by subjects is critical. Portcon or Port Security Context Labels are based on protocol and port number(s)/range.

As an example, under the SELinux Targeted Policy, the *httpd* subject can only listen on standard ports. If the system administrators change the default ports from 80(http) or 443(https), they will need to add a new portcon in the SELinux policy to allow *httpd* to bind to this port.

To view the defined Port Security Contexts in the loaded SELinux policy, issue the following command:

```
[root@vbg ~]# seinfo -p
```

As you can see, the Port Context information contains the protocol, port and the security context. As an example, the *http_port* security contexts defined in the Red Hat Targeted policy are:

```
portcon tcp 80 system_u:object_r:http_port_t:s0  
portcon tcp 443 system_u:object_r:http_port_t:s0  
portcon tcp 488 system_u:object_r:http_port_t:s0  
portcon tcp 8008 system_u:object_r:http_port_t:s0  
portcon tcp 8009 system_u:object_r:http_port_t:s0  
portcon tcp 8443 system_u:object_r:http_port_t:s0
```

As you can see, the first line of the output above labels the network Port 80 for TCP protocol with the security context:

```
system_u:object_r:http_port_t:s0
```

For the GUI initiated, policy details such as Booleans and Port Contexts can be viewed/modified by the *system-config-selinux* command:

```
[root@vbg services]# system-config-selinux
```

Do execute this command under the X environment to view and comprehend the building blocks of a SELinux Security Policy.

NodeCon

Node Security contexts are labelled by the nodecon statements in an SELinux policy. They can be used to apply access control restrictions from various hosts/nodes in the network. An effective security policy for network access to services can be created by creatively applying node context access restrictions.

To list the default node contexts in the loaded SELinux policy, issue the following command:

```
[root@vbg ~]# seinfo -o
```

The output specifies security contexts assigned to various hosts:

```
nodecon 0.0.0.0 255.255.255.255 system_u:object_r:inaddr_any_node_t:s0  
nodecon 127.0.0.1 255.255.255.255 system_u:object_r:lo_node_t:s0  
nodecon ::ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff system_u:object_r:runspec_node_t:s0  
nodecon ::ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff system_u:object_r:compat_ipv4_node_t:s0  
nodecon ::ffff:0000:0000 ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff system_u:object_r:mapped_ipv4_node_t:s0  
nodecon fe80:: ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff system_u:object_r:link_local_node_t:s0  
nodecon fec0:: ffco: system_u:object_r:site_local_node_t:s0  
nodecon ff00:: ff00: system_u:object_r:multicast_node_t:s0
```

Classes

Classes, or more specifically ‘Object Classes’, are the resources on which SELinux Access Restrictions are applied. Examples of Object Classes include file, dir and network sockets. An instance of an Object Class is called an Object.

To see the various Object Classes in the default loaded SELinux Policy, issue the following command:

```
[root@vbg ~]# seinfo -c
```

A file on your system, a network socket or a process—all of these are instances of Object Classes. A list of file related Object Classes in the default-loaded policy in my system is shown below:

```
blk_file - Block File
chr_file - Character File
lnk_file - Symbolic Links
fifo_file - Named Pipes
file - Normal Files
sock_file - UNIX domain sockets
filesystem - Partitions etc
dir - Directories
fd - File Descriptors
```

Permissions

Permissions on Object Classes constitute the access control restrictions defined in a SELinux security policy. As you can guess, permissions relate to read/write and other fine grained controls. To list various permissions that can be applied to each of the Object Classes in the default loaded policy, issue the following command:

```
[root@vbg ~]# seinfo -c -x
```

As an example, the permissions that can be applied to an instance of the “file” object in the Targeted Policy loaded on my system, are:

```
file
append
create
execute
write
relabelfrom
link
unlink
ioctl
getattr
setattr
read
rename
lock
relabelto
mounton
quotaon
```

```
swapon
entrypoint
execmod
execute_no_trans
```

The above example means that processes (subjects) can be given permissions to append, create, execute, write, etc. Depending on the permissions specified to a particular subject, a successful access or denial will occur.

For example, you can specify that the *httpd* process can create a file in the */tmp* folder, append to a file in the */var/log/* folder and only read from the */var/www/html* folder.

If a newly installed Web application tries to create a file in the */var/www/html* folder (assuming it is owned by the ‘apache’ user and has all the required DAC permissions using *chmod/chown*) it will still get a denial.

The above example clarifies how MAC restrictions prevent unauthorised tampering of data and secure your critical servers.

Attributes

Attributes group together types with similar properties. They make it easier to specify rules in a policy. For example, most applications (http, ftp, squid, mail) create log files. If the system administrator had to create individual rules for *logrotate*, appending and creating log files, it would involve a lot of repetitive work.

Once a type attribute is specified to a new object, permissions associated with that attribute are applied to the new object, saving a lot of repetitive work. To view a list of all attributes in the current loaded policy, issue the following command:

```
[root@vbg ~]# seinfo -a -x
```

You can see that log files are grouped together under the attribute *@attr1335*:

```
@attr1335
amavis_var_log_t
ccs_var_log_t
ricci_var_log_t
```

```
nscd_log_t
var_log_ksyms_t
ntpd_log_t
sendmail_log_t
var_log_t
```

We will deal with categories, sensitivities, *fs_use* and *genfscon* in detail in subsequent articles in this series. In this article we have looked at more building blocks of SELinux security policies. The various basic building blocks of a SELinux Security Policy can be summarised as:

- Users
- Roles
- Types
- Booleans
- Classes (Object Classes)
- Permissions (on Object Classes)
- Attributes
- Port Contexts
- Node Contexts

Access Control rules can be applied as per permissions assigned to classes. These rules can be summarised as:

- Allow rules—to allow access
- NeverAllow rules—to prohibit access

There are other rules as well—Type Transitions, AuditAllow, DontAudit, etc. In the next article we will explore how these rules are applied for access permissions to objects based on their Security Contexts.

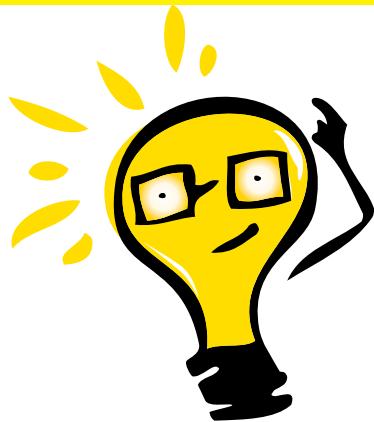
Still to come

- Understanding the Targeted Policy - Part III
- Policy Modules
- MLS and MCS



By: Varad Gupta

Varad is an open source enthusiast who strongly believes in the open source collaborative model not only for technology but also for business. India's first RHCSS (Red Hat Certified Security Specialist), he has been involved in spreading open source through Keen & Able Computers Pvt Ltd, an open source systems integration company, and FOSTERing Linux, a FOSS training, education and research training centre. The author can be contacted at varad.gupta@fosteringlinux.com



Tips & Tricks

Encryption with VIM

 *Editor's note: Last month we showcased a tip on how to encrypt a file using Vim. One of our readers had, in fact, sent a more detailed tip around the same time, which we have published this month.*

Create an encrypted file called *abc.txt*

```
[prabhat@localhost ~]$ vim -x abc.txt
```

This will prompt you to enter an encryption key (password) before creating the new *abc.txt* file.

Enter encryption key:***

Enter same key again:***

After entering the passphrase twice, the *abc.txt* file will finally be opened for entering data. Key in a few characters/words/sentences, then save and close the file.

Now try to read the file as you would with a typical command like *cat*:

```
[prabhat@localhost ~]$ cat abc.txt
```

VimCrypt~01!RBW

b

Eg[prabhat@localhost ~]\$

Did you notice that although you're the owner of the file, you yourself can't even read it without using the passphrase.

Go ahead and check the ownership and file permissions yourself, as follows:

```
[prabhat@localhost ~]$ ls -l abc.txt
-rw-rw-r-- 1 prabhat prabhat 33 Apr 12 00:07 abc.txt
```

Here's how you can check if this file has been corrupted or encrypted:

```
[prabhat@localhost ~]$ file abc.txt
abc.txt: Vim encrypted file data
```

It means it's not corrupt, but encrypted. Now to open the file, issue the following command:

```
[prabhat@localhost ~]$ vim abc.txt
```

You will be asked to enter the password for this file, that's it.

Now, how about changing this password? Let's say that earlier it was 123 and now we want to change it to 777. Here we go:

```
[prabhat@localhost ~]$ vim +X abc.txt
```

Enter encryption key:***

"abc.txt" [encrypted] 1L, 21C

Enter encryption key:***

Enter same key again:***

It's mandatory to save and quit, otherwise your new password will not be saved. So now your new password, 777, is set. Next time make sure you entered this new password while opening *abc.txt*.

Finally, how can we remove the password or encryption from file? Simple... Run the following command:

```
[prabhat@localhost ~]$ vim +X abc.txt
```

Open a file with your password and it will ask you to enter new encryption. Don't enter anything, but just hit the *Enter* key twice, followed by a *Save* and *Quit*. That's it! Now you can open your file without a password.

—Prabhat Rishi, prabhatrishi@rediffmail.com

Seven ways to log out of Bash

 How many ways do you know of to log out from a Bash shell? Here are at least seven commands that you may use to log out—but please be aware that some of the commands are dangerous if you're logged in as the root user because they could stop services/daemons that usually run as the root.

1. *logout*
2. *exit*
3. *CTRL+D*
4. *export TMOUT=1*
5. *fuser -k `pwd`* (Don't do this as the root)
6. *skill -KILL -u `whoami`* (Don't do this as the root)
7. *kill -9 \$\$* (Don't do this as the root)

 **Note:** *TMOUT* turns on the auto-logout feature and if there is inactivity for *N* seconds, the user is logged out from the shell.

—**Bharat Mumbaikar, bmumbaik@redhat.com**

 **Kill all process instances at one go**
Sometimes you might need to urgently kill all the Java processes. Use the following command to do so:

```
ps -ef | grep java | xargs kill -9 `awk '{print $2}'` > /dev/null 2>&1
```

This can be used for any application you want to kill. All you need to do is replace “java” with the name of the application.

For example, if you want to kill all instances of Firefox in a single command, then issue the following command:

```
ps -ef | grep firefox | xargs kill -9 `awk '{print $2}'` > /dev/null 2>&1
```

—**Senthil Kumar, hellomrsenthil@gmail.com**

 **Download a website**
Here is a simple and effective way to get the files downloaded recursively from a website without actually visiting each and every link to the sub pages. This is also useful in case the pages are of type XHTML or text type—one can make them *.html* by use of an appropriate switch like *-E*. Go to the directory onto which you wish to download all the content from site, and use the following command:

```
wget -r -p -k -E http://www.linuxdriver.co.il/ldd3/
```

...where:

- *-r* is for recursive download of pages
- *-p* is for linking pages locally so that users can browse them easily once the download is completed
- *-k* is to create the directory structure, and...
- *-E* is to create *.html* extensions to the type XHTML or text files.

Enjoy, and try out different contents on the Net. Do not forget to check out the manual pages for *wget*—

there's always more information there.

—**Vijendra Maurya, vijendra.maurya@ips.invensys.com**

Count the number of lines; and fold a file to a defined width

If we want to count the number of lines in a text file (say, *file.txt*) then use the following command:

```
cat -n file.txt
```

...or:

```
wc -l file.txt
```

fold is a very handy utility to wrap any size of file to a predefined width. For example, if we have a file named *jash.txt*, then we can use the command below:

```
fold -sw 60 jash.txt > output.txt
```

This will create an output file named *output.txt* with a predefined width of 60. Here *-s* breaks spaces and *-w* defines the width of the column, which is 60 in our example.

—**Jasvendar Singh M. Chokdayat, theindianjash@gmail.com**

Text-based Web browsing

You may use *elinks* or *links* in text mode to browse websites from a console. *elinks* can not only be controlled by a keyboard but also by the mouse to an extent, and is an advanced version of *links*. Here's how to get started:

```
elinks http://www.google.com
```

This will open Google.com in your browser. Press the *Esc* key to access the menu where, among other items, you will find *File*→*Exit* to close the browser.

—**Yogesh Vaishnav, friendlyyogi@gmail.com**



Share Your Linux Recipes!

The joy of using Linux is in finding ways to get around problems—take them head on, defeat them! We invite you to share your tips and tricks with us for publication in LFY so that they can reach a wider audience. Your tips could be related to administration, programming, troubleshooting or general tweaking. Submit them at www.linuxforu.com. The sender of each published tip will get an LFY T-shirt.



iPhone Development on Linux

Learn how to set up the Open Tool Chain for iPhone on Linux.

I know you're wondering how can this author talk so positively about the iPhone, after his article titled *The True Open Phone Platform*, published in the January 2008 issue of *LINUX*

The iPhoneDevTeam

According to Wikipedia: "The iPhone Dev Team is a group of influential hackers among the iPhone OS community responsible for a number of widely-used jail-breaking and unlocking applications for Apple's iPhone and iPod Touch devices. These applications provide owners with the ability to sidestep the limitations placed on devices by the manufacturer, allowing for activities such as deep customisation and SIM unlocking. The team is notable for discouraging the practice of warez (refers primarily to copyrighted works traded in violation of copyright law) and its team members take great care to ensure all releases are free from Apple's copyrighted code, to a point where members violating this are dismissed from the team." For more information visit en.wikipedia.org/wiki/iPhone_Dev_Team.

For You, which focused on the OpenMoko platform. But things have changed since then. And guess what, I love my iPhone. I love OpenMoko very much too, but both are in different leagues.



Note: iPhone 2G, iPhone 3G and iPod Touch share the same OS with variations like: iPod Touch does not come with GPS, Phone and Bluetooth; and iPhone 2G does not have 3G, A2DP capable Bluetooth and GPS. However, all these devices share a larger set of common elements that will make your application run on all the platforms. The primary benefit of using iPod Touch over iPhone is the price. You will get an iPod Touch 8GB in India for Rs 14,000, whereas iPhone 3G 8GB will cost you a whopping Rs 31,000

(quoting Airtel's price). In this article I will mainly talk about iPhone 3G, but it can be applied to other devices as well, with a few exceptions.

The iPhone

iPhone is, in a way, probably the world's best smartphone till date. Earlier, it used to be locked and developers were only allowed to build Safari Web applications. (Safari is Apple's Web browser based on Apple's Webkit, which is based on KDE's KHTML engine.) Argh!! Because of this horrible limitation I was not looking at iPhone as a serious opportunity for developers. But Apple has changed for the better. Not only has it opened the iPhone APIs, but has also constantly improved the SDK with thousands of new APIs accompanying each release.

For developers, this is a dream come true. With iPhone OS 3.0 slated for release in mid-2009, there should soon be a 1,000 new APIs for iPhone, which will enable developers to do cool things:

- **In App Purchase:** Enable you to purchase additional content from within the applications. A good example would be games, where someone can purchase an extra level from within the game. This means an extra revenue source for developers.
- **Apple Push Notification Service:** A way by which an application can trigger events, and send messages and alerts even when the application is not running. A good example would be an IM client in which you can log in and close the application, and still receive IM notifications.
- **External Accessory Framework:** Hardware developers can use this API to give their device a great face and powerful ARM CPU. Devices can communicate over iPhone's 30-pin dock connector and wirelessly over Bluetooth. An excellent example was shown by a medical company at the iPhone OS 3.0 pre-release announcement event. The company had connected its blood sugar checking device to iPhone to create a full blown life-saving application for diabetic patients, which offered suggestions on what to eat, how much to exercise and what medicines to take. Useful, isn't it?
- **P2P Device Connectivity:** A great set of APIs that allows multiple iPhone devices to interact with each other over Bluetooth, without pairing. Again, at the iPhone OS 3.0 pre-release event, the developer of the music app, Smule, connected multiple devices running Smule to produce orchestra-like music.
- **Maps (and location APIs):** Developers can build applications that will interact with users based in their locality. They can integrate Google Maps within their applications. Imagine a food application telling you the address for your favourite cuisine that's available close by.

These are just a few of the *new* APIs that will be available in iPhone OS 3.0—many others are already available in the current version of iPhone OS/SDK.

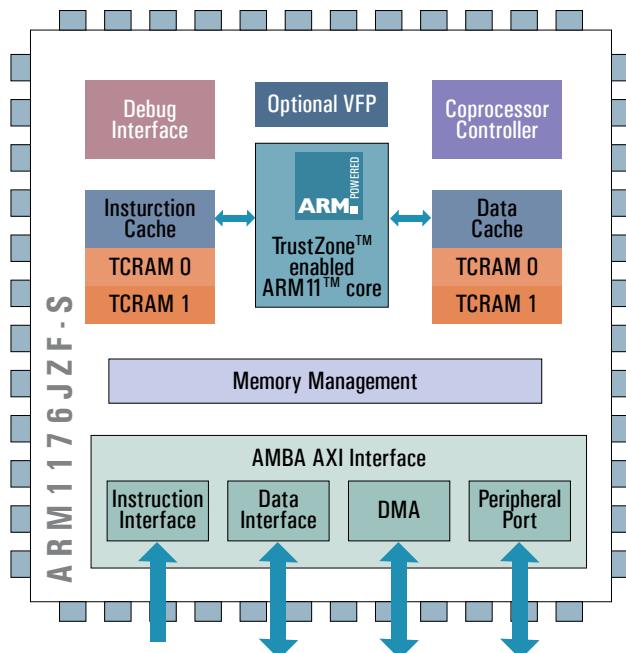


Figure 1: The ARM 1176JZF architecture

iPhone hardware

That's not just all; iPhone is powered by insanely powerful hardware. Let's look at the specs:

- CPU: 620 MHz ARM 1176, under-clocked to 412 MHz
- GPU: PowerVR MBX Lite 3D
- Storage capacity: Flash memory (Original: 4, 8, & 16 GB; 3G: 8 & 16 GB)
- Memory: 128 MB DRAM
- Display: 480×320 px, 3.5 inch (89 mm) colour LCD with an aspect ratio of 3:2, capable of up to 2,62,144 colours.
- Input: Dock connector, headphone jack, Wi-Fi (802.11b/g), Bluetooth 2.0+EDR
- Camera: 2.0 mega-pixels
- Connectivity: Quad-band GSM 850 900 1800 1900 GPRS/EDGE
- 3G also includes: Tri-band UMTS/HSDPA 850, 1900, 2100, A-GPS
- Accelerometer: Detects the movement in hardware and reacts accordingly.

Let's talk about the CPU to begin with. Yes, it is ARM—don't you guys get sick of seeing it all the time? This is the second time I am talking about ARM in *LFY*; the first instance was for the Nokia 6630 (*Outsmart Your Smart Phone*, published way back in June 2006). In short, ARM is the CPU for all next-generation devices these days, including Nintendo DSi (the game console), Nokia smartphones (6630, N73, N95), iPods, and so on.

The one included in iPhone is even better:

- The ARM1176JZF chip with TrustZone (enables a trusted computing environment for media, apps, network, OS, etc). Yes, not a lot of people like the trusted-environment bit—and the reasoning is quite



Figure 2: The iPhone UI elements

fair. Refer to Figure 1 to understand its architecture.

- Can vary in clock speed up to 700MHz or more, depending on implementation.
- ARM Intelligent Energy Manager (which is supposed to reduce power consumption by 25-50 per cent in portable devices).
- 16K/16K cache
- Features a vector floating point coprocessor (for embedded 3D-graphics)
- ARM Jazelle enabled for embedded Java execution
- SIMD, high performance integer CPU (8-stage pipeline, 675 Dhystone, 2.1 MIPS)
- 0.45 mW/MHz power draw (with cache)

After reading the sixth point, you might think that iPhone 3G supports Java, but that is not the case. But we do have a way by which we can install Java on iPhone.

iPhone supports the OpenGL ES specification. It is arguably the best 3D API available for mobile devices, and existing ES applications can be ported very easily.

iPhone UI elements (visual look)

I know it is absurd to suddenly talk about the UI elements, but I am so impressed by the iPhone's look and feel that I thought it would be a good idea to impress you as well.

The deal is, the iPhone default interface is awesome (well, looks *do* sell!) and the SDK enables every developer to create an application with the same look and feel. So, third-party applications will essentially look integrated into the iPhone OS. You may very well give users the feel of a factory-bundled application when you develop your own app.

Hope the collage in Figure 2 gives you an idea of what I am talking about.

The OS

Now, tell me what could possibly be the best thing that could happen to an iPhone? iPhone running Linux as an operating system, right? Not quite... But it's running UNIX at least. Or actually running an open source kernel called XNU.

iPhone OS is essentially the stripped down version of the Mac OS X in almost every aspect. That means the iPhone OS:

- Runs a kernel called XNU (X is not UNIX), which is a hybrid kernel based on MACH (operating system micro-kernel developed at Carnegie Mellon University) and BSD.
- Is compatible with the Single UNIX Specification version 3 (SUSv3) and POSIX UNIX applications and utilities, including Bash, cat, etc.
- Supports kernel cache, a flat file with all drivers loaded.
- The UI abstraction layer (responsible for awesome UI elements) is powered by Cocoa Touch, which is based on the Mac OS X desktop version of Cocoa API.

There is much more to the MAC OS X operating system when we look at it from a UNIX point of view. I would like to cover it in detail, if Linux fans have no problems looking into other UNIX variants.

iPhone development: The Apple way

It's time to get started, but first the bad news. Apple does not provide an SDK for Linux. The iPhone SDK is only available for Mac OS X. However, the good news is that there is an Open Toolset that we can use on Linux, to develop for iPhone.

Historically, iPhone has been a closed device and still is. The Apple way to develop for iPhone looks like this:

1. Join the iPhone Developer Program at developer.apple.com/iphone/program with a membership fee of \$99.
2. Download the iPhone SDK from developer.apple.com/iphone/program/download. The SDK is entirely free (of cost). But deploying on the real iPhone requires paid membership.

The iPhone SDK essentially includes a world class IDE called Xcode. It is a suite of tools for developing software on Mac OS X, created by Apple. The Xcode suite includes a modified version of free software GNU Compiler Collection (GCC, apple-darwin9-gcc-4.0.1 as well as apple-darwin9-gcc-4.2.1, with the former being the default), and supports C, C++, Fortran, Objective-C, Objective-C++, Java, AppleScript, Python and Ruby source code with a variety of programming models, including Cocoa, Carbon, and Java.

Third parties have added support for GNU Pascal, Free Pascal, Ada, C#, Perl, Haskell and D. The Xcode suite uses GDB as the back-end for its debugger. Xcode can be used to compile and debug applications for the ARM processor used in iPhone and iPod Touch.

If you ask me, Xcode is probably the best IDE available that uses GCC and GDB as the backends. In other words, it's way better than Visual Studio and it uses the GNU toolset. Xcode is available free from developer.apple.com/tools/xcode.

3. Sign your application with the developer certificate that you got from enrolling in the iPhone Developer program. Deploy and test it on your device.
4. Submit your application to App Store for Apple's approval. App Store is a service for the iPhone and iPod Touch created by Apple that allows users to browse and download applications from the iTunes Store that was developed with the iPhone SDK and published through Apple. The apps are available for purchase or free of charge, depending on the application. App Store is available from both iTunes and iPhone.
5. If approved, you can see your application in the App Store. If you are selling a paid application, Apple will keep 30 per cent of sales revenue and give you 70 per cent. Figure 3 showcases the Indian App Store that you can access from iPhone.

That is the best way to go, if you have the money and have development on your mind. But that involves purchasing Mac hardware. As they say, if you spend money, you get money.

iPhone development: The open way

Even with all these cool features, let's understand this: the factory-shipped iPhone is a closed device, like any other consumer computing device. If we talk about 'closedness', iPhone generally falls under the game console category along with Xbox 360, PlayStation 3, Sony PSP and Nintendo WII. All these devices are very powerful computing devices. But the systems developers want to restrict the applications that are run on them. This gives them more control over the software and hence helps them to channelise the revenue generated. Most of the time, this is implemented with code signatures, where the signing key is only available to the hardware makers. Whatever applications run on these platforms have to be signed by the systems makers, and only then will they run on those systems. The reason is quite obvious.

Now, allow me to clarify; code signing in itself is not a bad thing. Code signing helps users to verify the source of the application and hence keep them safe from malicious code. In Linux, RPM repositories use GPG-based signatures to verify the integrity of RPM source. Windows uses device driver signatures to ensure the stability of a driver. The only difference is that even if something is not signed, it will run on Linux and Windows systems, whereas on consumer devices like the iPhone, it will simply not run.

iPhone lives in a 'jail', literally! In the UNIX world we called it the *chroot* jail. All iPhone interfacing applications, such as iTunes, run in a *chroot* environment where no application can peek into the operating system. Also, the applications that run on iPhone must be signed by Apple in order to run.

Before we proceed, let's try to understand *chroot* jails. *chrooting* is a verb that evolved from the *chroot* (2) system call, which is used to change the root of the file system as seen by the calling process. When a process requests to *chroot* to a given directory, any future system calls issued by

the process will see that directory as the file system root. It becomes impossible to access files and binaries outside the tree rooted on the new root directory. This environment is known as a *chroot* jail.

A jail is a directory in your system, and the user cannot see/do anything outside that directory. In other words, the user is jailed in the directory. The *chroot* (2) system call is used to put the user inside this jail. If you want the user to be able to do one thing, that one thing should be possible inside the jail. For example, if you want the user to be able to run SCP, you need to have a copy of SCP installed in the jail, in addition to the means to execute it (a shell).

In order to run your own application on iPhone (without Apple's signature), you must free your iPhone from this 'jail', commonly referred to as jail-breaking your iPhone.

 **Warning:** I am not a lawyer. Before jail-breaking your iPhone, please check whether this renders your warranty as null and void. A Google search might help.

You will need a Windows or Mac system to jail break your device. It is a very easy process. Please visit iPhone dev team's blog at blog.iphone-dev.org/post/74278878/close-the-stable-door to understand the process. Download a tool called QuickPwn, a very self-explanatory tool that will help you render your iPhone as jail broken within minutes.

Setting up your iPhone for development

Jail-breaking your iPhone will give you a lot of UNIX utilities installed on the iPhone, including BSD user land applications. Jail-breaking also installs a Debian-based GUI package management tool called Cydia (refer to the sidebar title 'Cydia Package Manager' for more information on this utility). Open Cydia and search for software called

Cydia package manager

 Quoting Wikipedia: "Cydia is a Debian Apt-based package installer/manager for the iPhone and iPod Touch, created and maintained by Jay Freeman (saurik), which allows users to browse and download applications from a range of sources. Most applications are available to download for free, with some requiring purchase after downloading, and as of the 1.0.2790-44 release, applications are available to purchase from within the application." For more details visit [en.wikipedia.org/wiki/Cydia_\(iPhone_OS\)](http://en.wikipedia.org/wiki/Cydia_(iPhone_OS)).



Figure 3: Indian App Store on iPhone



Figure 4: Installing OpenSSH using Cydia

OpenSSH (Figure 4). This will help in connecting to iPhone over Wi-Fi and to run UNIX commands. If you want, you can also install an application called Terminal, which will give you a shell environment on your iPhone. The default shell for iPhone is Bash.

Also note down the IP address of your iPhone. Connect your iPhone to the Wi-Fi network. Go to *Settings*→*Wifi*→*Wifi Acess Point Name*, and note down the IP address.

Building the free tool chain

In this section, we will build the tool chain for iPhone, which includes the compiler, linker, etc. I am using OpenSUSE 11.1, but this should work on any Linux distro.

Make sure you install the following software on your Linux distribution before proceeding:

1. Basic development tools including GCC, Make, Autotools, Flex, Bison, autoconf, automake, etc.
2. Objective C Support for GCC is very important. Search for Object C or Objective C in your package manager
3. Git and SVN
4. cpio
5. libxml2-dev, needed to build xar
6. xar (code.google.com/p/xar) and *dmg2img* [available on *LFY DVD/software/magazine/iPhone*]. Build and install xar:

```
$ tar xvfz xar*
$ cd xar*
$ ./configure --prefix=/usr && make
$ sudo make install
```

Build and install *dmg2img*:

```
$ tar xvfz dmg2img*
$ make
$ sudo cp dmg2img /usr/bin/dmg2img
```

7. MacOSX10.4u.sdk—This one is little tricky. Here is how to get it:
 - Download “Xcode for iPhone and Mac Development” from developer.apple.com/technology/Xcode.html.
 - Convert the dmg file to a flat img file


```
$ dmg2img -i iphonesdk.dmg -o iphonesdk.img -v
```
 - Mount the img file to */tmp/iphonesdk*. Make sure you are logged in as the root. Or use the *sudo* command.

What's this ‘Objective-C’ thing?

The Wikipedia says: “Objective-C is a reflective, object-oriented programming language, which adds Smalltalk-style messaging to C. Today it is used primarily on Apple’s Mac OS X and iPhone OS, two environments based on the OpenStep standard, and it is the primary language used for Apple’s Cocoa API, though it was originally used as the main language on NeXT’s NeXTSTEP OS. Generic Objective-C programs, which do not make use of these libraries, can also be compiled for any system supported by gcc, which includes an Objective-C compiler.” For more information refer to en.wikipedia.org/wiki/Objective-C.

This essentially means that if you want to program for MAC OS X and iPhone, you have to do it in Objective C. Fortunately, all Linux distributions support Objective C.

```
# modprobe hfsplus
# mount -t hfsplus -o loop iphonesdk.img /tmp/iphonesdk
```

- Copy the MacOSX10.4.Universal.pkg


```
# mkdir /tmp/extract
# cp Packages/MacOSX10.4.Universal.pkg /tmp/extract
```
- Extract the pkg file using xar


```
# cd /tmp/extract
# xar -x -v -f *.pkg
```
- You will have a big file called Payload. Extract the payload file


```
# mv Payload Payload.gz
# gunzip Payload.gz
# cat Payload | cpio -i
```
- Finally copy the folder MacOSX10.4u.sdk


```
# cd SDK
# mkdir /isdk
# cp -r MacOSX10.4u.sdk /isdk/
```

Copy the iPhone file system

We will need to copy the iPhone file system that will help us in getting iPhone libraries and frameworks.

 **Warning:** I am not a lawyer. Check Apple’s *Terms and Conditions* yourselves to make sure that you are not breaking any laws.

Do the following:

```
# mkdir -p /toolchain/sys/
# cd /toolchain/sys/
# mkdir -p ./System/Library/.usr
# scp -r root@<iPhone IP Address>:/System/Library/Frameworks/ ./System/Library
# scp -r root@<iPhone IP Address>:/System/Library/PrivateFrameworks/ ./System/Library
# scp -r root@<iPhone IP Address>:/usr/lib ./usr
```

Set up the environment variable

You can either set up these variables in your `.bahsrc` files or give a series of export commands while building the tool chain.

```
# export target=arm-apple-darwin9 //Sets the target build environment
# export prefix=/toolchain/pre      //Sets the default prefix path
# export sysroot=/toolchain/sys
# export PATH="$prefix/bin":$PATH
# export cctools=/toolchain/src/cctools
# export gcc=/toolchain/src/gcc
# export csu=/toolchain/src/csu
# export build=/toolchain/bld   //Sets the build directory
```

Once environment variables are set do the following:

1. Install Csu, which provides C hooks into assembly's "start" entry point, and sets up the stack so that your program's main() function can be called.

```
# mkdir -p ${csu}  
# cd "${csu}"  
# svn co http://iphone-dev.googlecode.com/svn/trunk/csu .  
# cp -R *.* ${sysroot}/usr/lib  
# cd ${sysroot}/usr/lib  
# chmod 644 *.o  
# cp -Rf crt1.o crt1.10.5.o  
# cp -Rf dylib1.o dylib1.10.5.o
```

2. Build the GNU Tool Chain: This includes building a cross-compiling tool chain such as an assembler, linker and so on

```
# rm -rf "${cctools}"  
# svn co http://iphone-dev.googlecode.com/svn/branches/odcctools-9.2-  
ld "${cctools}"  
# mkdir -p "${build}"  
# cd "${build}"  
# mkdir cctools-iphone  
# cd cctools-iphone  
# CFLAGS=-m32 LDFLAGS=-m32 "${cctools}"/configure --target="${target}"  
--prefix="${prefix}" --disable-ld64  
# make  
# make install
```

3. Installing the iPhoneOS Header Files: This is where we use our hard-earned MacOSX10.4u.sdk.

```
# cd "${build}"  
# svn co http://iphone-dev.googlecode.com/svn/branches/include-1.2-  
sdk include  
# cd include  
# ./configure --prefix="${sysroot}/usr" --with-macosx-sdk=/isdk/  
MacOSX10.4u.sdk  
# bash install-headers.sh
```

4. Building LLVM Compiler (According to Wikipedia: “The Low Level Virtual Machine, generally known as LLVM, is a compiler infrastructure, written in C++, which is designed for compile-time, link-time, run-time, and “idle-time” optimisation of programs written in arbitrary programming languages. For details refer to en.wikipedia.org/wiki/Low_Level_Virtual_Machine.)

[OrgWiki/LOW](#)

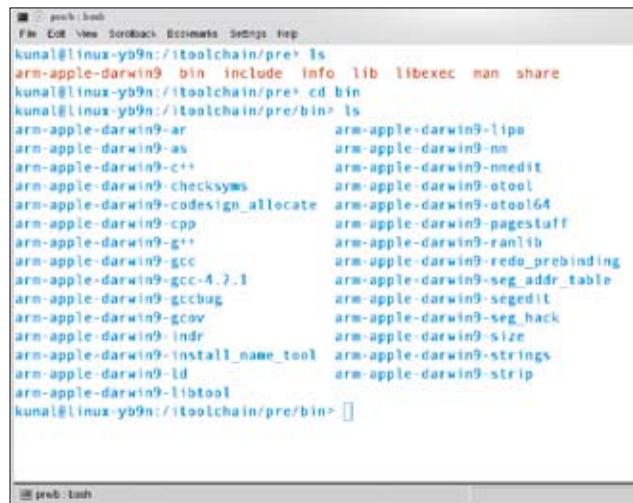


Figure 5: Listing of iPhone tool chain binaries

```
# git clone git://git.saurik.com/llvm-gcc-4.2 "${gcc}"
# mkdir -p "${build}"
# cd "${build}"
# mkdir gcc-4.2-iphone
# cd gcc-4.2-iphone
# "${gcc}"/configure --target="${target}" \
--prefix="${prefix}" --with-sysroot="${sysroot}" \
--enable-languages=c,c++,objc,obj-c++ \
--with-as="${prefix}"/bin/"${target}"-as \
--with-ld="${prefix}"/bin/"${target}"-ld \
--enable-wchar_t=no \
--with-gxx-include-dir=/usr/include/c++/4.0.0
# make -j2
# make install
# mkdir -p "${sysroot}"/"$(dirname "${prefix}")"
# ln -s "${prefix}" "${sysroot}"/"$(dirname "${prefix}")"
```

After doing all this, you should have binaries listed in Figure 5 in place.

A HelloWorld application

Let's build and deploy a simple `HelloWorld` application. To understand this code, you need to learn Objective-C. Apple has extensive documentation on it—check out developer.apple.com.

The following is the code for `HelloWorldApp.h`:

```
#import <CoreFoundation/CoreFoundation.h>
#import <Foundation/Foundation.h>
#import <UIKit/UIKitWindow.h>
#import <UIKit/UIKit.h>
#import <UIKit/UIKitApplication.h>
#import <UIKit/UITextView.h>
#import <UIKit/UINavigationBar.h>
#import <UIKit/UIView.h>
#import <UIKit/UIAccelerometer.h>
```

```
@interface HelloWorldApp : UIApplication <UIAccelerometerDelegate> {
```

```
}
```

```
@end
```

Given below is the code for HelloWorldApp.m:

```
#import "HelloWorldApp.h"

@implementation HelloWorldApp
- (void) applicationDidFinishLaunching: (id) unused
{
    UIWindow *window;

    window = [[UIWindow alloc] initWithFrame:[[UIScreen mainScreen] bounds]];

    /* Create a text view */
    textView = [[UITextView alloc]
        initWithFrame: CGRectMake(0.0f, 48.0f, 320.0f, 100.0f)];
    [textView setText:@"Ciao"];

    /* Create a main view, and add our text view as subview */
    mainView = [[UIView alloc] initWithFrame: [[UIScreen mainScreen] bounds]];
    [mainView addSubview:textView];

    /* Setup window */
    [window makeKeyAndVisible];
    [window addSubview: mainView];
}

@end
```

The following is the code for Main.m:

```
#import <Foundation/Foundation.h>
#import <UIKit/UIKit.h>
#import "HelloWorldApp.h"

int main(int argc, char **argv) {
    int retval;

    NSAutoreleasePool *pool = [ [ NSAutoreleasePool alloc ] init ];
    retval = UIApplicationMain(argc, argv, @"HelloWorldApp", @"HelloWorldApp");
    [pool release];
    return retval;
}
```

To build this application, you first have to make sure that cross compilers are in the path:

```
$ export PATH=$PATH:/toolchain/pre/bin
```

Then run the following command:

```
$ arm-apple-darwin9-gcc -o HelloWorld Main.m -lobjc \
-framework CoreFoundation -framework Foundation \
-march=armv6 -mcpu=arm1176jf-s
```

Here is the explanation of the above command:

- *arm-apple-darwin9-gcc* is the name of the cross-compiler

itself. This is located in */toolchain/pre/bin*.

- *-o HelloWorld* tells the compiler to output the compiled executable to a file named *HelloWorld*.
- *Main.m* is the name of the source file(s) being included in the program, separated by spaces. The *.m* extension tells the compiler that the sources are written in Objective-C.
- *-lobjc* tells the compiler to link in the tool chain's Objective-C messaging library, which is needed by all iPhone applications.
- *-framework CoreFoundation -framework Foundation* are two of the base frameworks to be linked into the application. Depending on what components of the operating system are being used in the code, different frameworks provide different functionality.
- *-march=armv6 -mcpu=arm1176jf-s* sets the correct architecture and CPU type of the executable.

Now create the iPhone .app (Application) file:

```
$ cp -p HelloWorld ./HelloWorld.app/
```

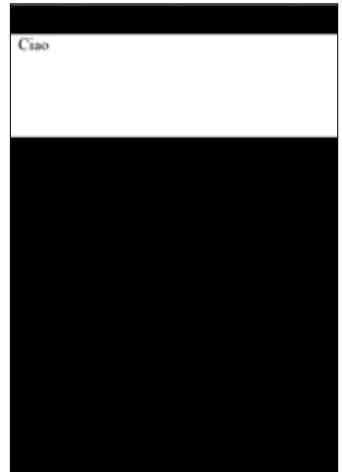


Figure 6: The HelloWorld app –yes, it does seem dumb!

Once the application is built, you can deploy it on your iPhone using *scp* command:

```
$ scp -r HelloWorld.app root@<ip address of iphone>/Applications
```

Sign your application (required for firmware >= 2.0) by running the following command from the iPhone SSH terminal:

```
$ ldid -S /Applications/HelloWorld.app/HelloWorld
```

Go to the iPhone Spring Board (iPhone App launcher interface) and launch your application. Your application will look something like the screenshot in Figure 5.

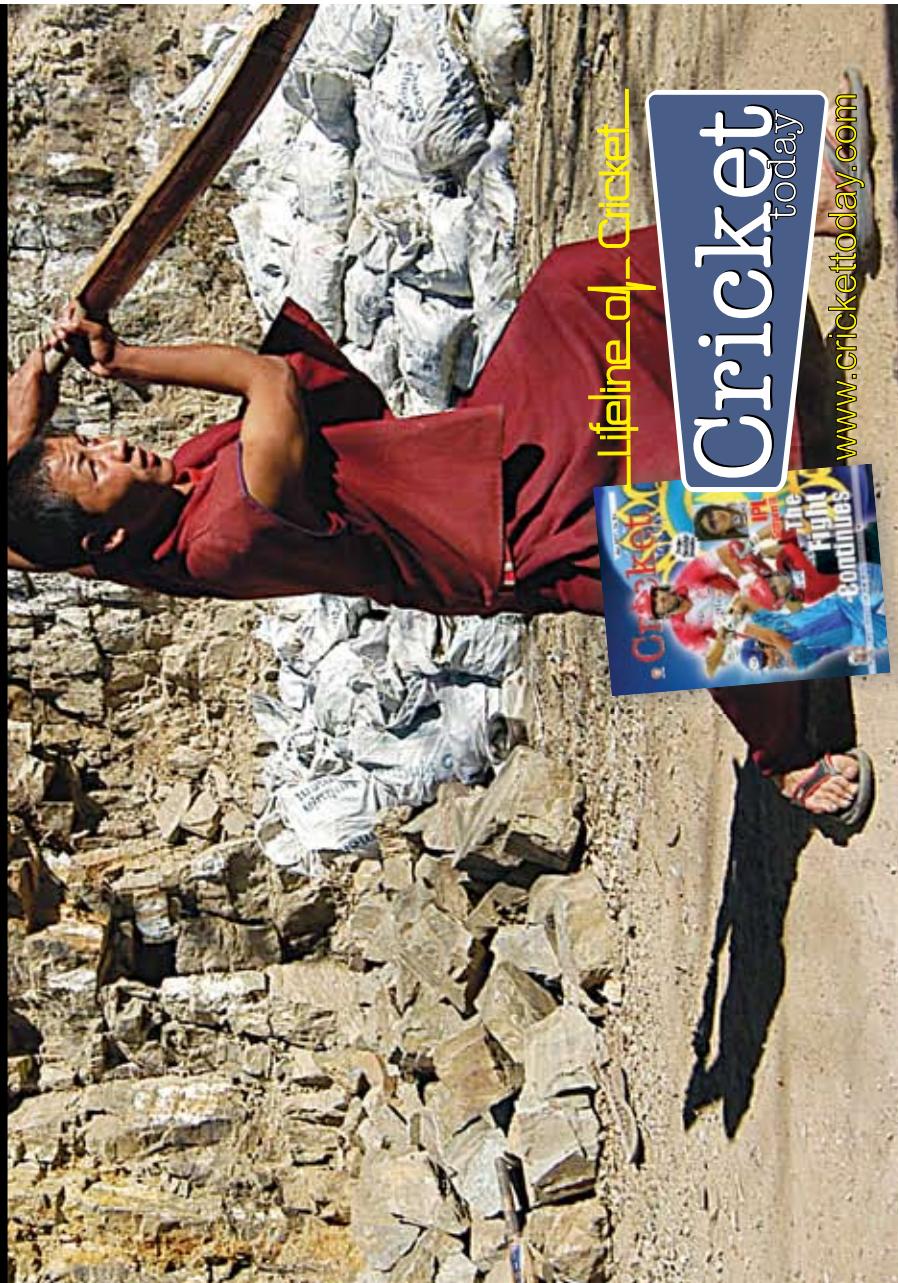
Sure I know that's a dumb application, but go check out the App Store and find out what's possible. 

By: Kunal Deo

The author is a veteran open source developer. He's currently leading two open source projects—WinOpen64 & KUN Wiki. He has contributed to many projects including, KDE-Solaris, OpenMoko and Python mw-serve. Kunal has written numerous articles on FOSS, Solaris and Linux-related technologies for various technical magazines around the globe. He is also writing a book titled "Porting On Open Solaris". In his free time he loves playing games on his XBOX360 and Playstation3. He blogs at kunaldeo.blogspot.com.

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Programming in Python for Friends and Relations—Part 14



A Musical Button

As we discovered last month, *csound* can be used to create new instruments. Now, how about creating what sound like 'real' instruments?

*S*oundFont is a trademark of E-mu. In the 1990s, E-mu came up with the idea of storing samples of the sounds of real instruments and replaying them with the desired effects. The aim was that SoundBlaster cards from Creative Labs should be able to play MIDI files realistically.

A composer can compose music and explore it with an 'orchestra' of instruments even if he is alone in his studio. We, however, are after a more limited goal.

The TamTam activities included in the OLPC/Sugar environment are really great tools for children to explore music and sounds. We will try to explore and understand the underlying relationship

between *csound* and SoundFonts.

On Fedora 10, SoundFonts are available in */usr/share/soundfonts*. *PCLite.sf2* is a part of the package, *PersonalCopy-Lite-soundfont*. Incidentally, this SoundFont is also required by *Timidity++*, a software player of MIDI files.

On Ubuntu 8.10, the SoundFonts, */usr/share/sounds/sf2/FluidR3_GM.sf2*, are installed by the *fluid-soundfont* packages.

The CSD file

Create the following *sf2.csd* file, with the definition of an instrument that plays SoundFont notes:

```
<CsoundSynthesizer>
<CsOptions>
```

```

</CsOptions>
<CsInstruments>
sr = 16000
ksmps = 160
nchnls = 2
gisf sfload "/usr/share/soundfonts/PCILite.sf2"
sfpassign 0, gisf

instr 1
ivel = p4
inotenum = p5
ipreindex = p6
iamp = p7
a1, a2 sfplay ivel, inotenum, iamp ,1, ipreindex, 0
    outs a1, a2
endin
</CsInstruments>
<CsScore>
</CsScore>
</CsoundSynthesizer>

```

The above file structure is the same as what was discussed in the last article. The SoundFonts need to be loaded and presets (instruments) assigned. An orchestra instrument can play the SoundFont notes using the *sfplay* opcode. You can find out more details at www.csounds.com/manual/html/sfplay.html.

The *ivel* parameter has a value between 0 and 127, and is the velocity or the vigour with which a musician plays the note—this translates into volume. You can use the *iamp* parameter as a factor to further adjust the volume.

The frequency is determined by *inotenum*, which also ranges between 0 and 127. The MIDI notes between 48 and 72 correspond to frequencies between 130.81Hz and 523.25Hz [www.phys.unsw.edu.au/jw/notes.html]. This range shows the most noticeable difference between the various presets.

You may wish to experiment with various preset indexes, for example, 0 is a grand piano, 24 is a guitar, 40 is a violin, 104 is a sitar, and 117 is a drum. The index is displayed when you run *csound* for the above *csd* file (on Fedora, but not on Ubuntu).

In the case of Ubuntu, you will need to replace the *sfload* command in the *sf2.cs* file by using the following code:

```
gisf sfload "/usr/share/sounds/sf2/FluidR3_GM.sf2"
```

A better definition of an instrument to play SoundFonts will be more complex.

The Python code to explore the differences

Write the following code in *play_sf2.py*:

```
# Import the Csound API extension module.
import csnd
```

```

import sys

def add_score(csound, inst, dur, amp):
    time = 0
    vel = 127
    for note in range(48,72):
        csound.addNote(1, time, dur, vel, note, inst, amp)
        time += dur
    csound.addScoreLine('e 2')

# Command line parameters:
# Instrument Index, note duration, amplification
inst = int(sys.argv[1]) if len(sys.argv) > 1 else 0
note_duration = float(sys.argv[2]) if len(sys.argv) > 2 else 0.5
amp = float(sys.argv[3]) if len(sys.argv) > 3 else 1.0
print 'Instrument, note duration, amplification:', inst, note_duration, amp
# Create an instance of Csound.
csound = csnd.CppSound()
csound.setPythonMessageCallback()
csound.load('sf2.cs')
csound.setCommand('csound -dm0 -T -odac -+rtaudio=alsa temp.orc
temp.sco')
add_score(csound, inst, note_duration, amp)
csound.exportForPerformance()
csound.perform()

```

The code is very similar to what we explored last month. The *add_score* method inserts notes to play on the first orchestra instrument.

You may pass command line parameters to specify the preset index, the note duration and the amplification. By default, the program will play a piano with each note for half a second and an amplification factor of 1.

The *csound* command in the code plays the notes directly and does not create an intermediary wave file.

Try the following options to compare the notes of a piano being played for a short and for a longer duration.

```
$ python play_sf2.py 0 0.3 2
$ python play_sf2.py 0 2 2
```

Now, compare a sitar with a violin:

```
$ python play_sf2.py 104 2 2
$ python play_sf2.py 40 2 2
```

As you can imagine, you can easily spend a few hours studying the differences.

A one-button music player

So far, you have been writing a program and playing the notes. Can you program *csound* to play notes interactively, for example, by pressing buttons or keys? The answer is, of course, yes!

The following command line option for *csound* will help:

-L dnam read Line-oriented realtime score events from device 'dnam'

You may use the option to send the score in real time by using the device *stdin*!

For the minimal application, you will have two widgets to set the instrument index and note number. You can then use a 'Play' button that will play the note as long as the button is pressed.

You can create a better version by replacing the note number text box by multiple buttons or map keys on the keyboard to note numbers.

First, you need to write the code to start the *csound* server listening on the *stdin*. So, write the following code in *tk_sf2.py*, which uses the subprocess module. It will start the *csound* command and open a pipe for *stdin*.

```
import subprocess
def start_csound():
    command = ['csound -dm0 -T -odac -rtaudio=alsa -L stdin sf2.csd']
    csd = subprocess.Popen(command, shell=True, stdin = subprocess.PIPE)
    return csd
```

You will need to add a line to the score section of *sf2.csd* as follows:

```
<CsScore>
i 1 0 180
</CsScore>
```

The score duration of 180 seconds ensures that *csound* will listen on *stdin* for three minutes before shutting down. There must be a better solution but I have not found one, so far.

Now, you can add the code to display a minimalist and very plain looking Tkinter form. The form contains a list box to select the instrument, a text entry widget for the MIDI note number and a button that calls the method *play_note* when pressed and *stop_note* when released. You can fill in the code in these methods shortly.

```
def play_form():
    def play_note(e):
        pass
    def stop_note(e):
        pass
    root = Tk()
    instr_box = Listbox(root)
    for instr in instruments:
        instr_box.insert(END, instr)
    instr_box.select_set(3)
    instr_box.pack()
    note_label=Label(root, text="Enter Note Number: 0-127")
    note_label.pack()
    note_box = Entry(root)
```

```
note_box.pack()
play = Button(root, text="Play")
play.bind("<Button-1>", play_note)
play.bind("<ButtonRelease-1>", stop_note)
play.pack()
return root
```

Now, add the code to start the *csound* server, fill in the instruments of interest in the list box and start the GUI application.

```
csd = start_csound()
instruments = {'Piano':0, 'Guitar':24, 'Violin':40, 'Sitar':104, 'Drums':117}
play_form().mainloop()
```

Finally, you will replace the dummy *play_note* and *stop_note* methods with appropriate code:

```
def play_note(e):
    notenum = note_box.get()
    instr = instr_box.get(instr_box.curselection()[0])
    preset_index = instruments[instr]
    # i line: parameters p1..p7
    # p1, p2, p3 : csound instrument, starting time, duration,
    # p4..p7: velocity, Midi Note Num, Preset Index, Amp
    csd.stdin.write('i 1 0 -1 127 ' + notenum + ' ' + str(preset_index) + ' 2\n')
def stop_note(e):
    csd.stdin.write('i 1 0 0 \n')
```

To play a note, you should pick up the preset index and note number. Then you need to construct the string and write it on the *stdin* pipe of *csound*. A value of -1 for the duration implies that you keep playing the note till another score command is received for the instrument. Since it is being played in realtime, the start time indicates the amount of delay after this score line has been received.

So, the *stop_note* method is simple. It just writes a score to play the piano for '0' period of time with '0' velocity; hence, stopping the note which was being played.

This leads to the question of how to create an orchestra of multiple instruments? You will need to modify *sf2.csd* file to define additional instruments like the first one. Then, independent score commands can be given to each of the instruments.

Now, imagine programming each of the many instruments and, then imagine the delightful effect when all these instruments play together. No wonder great composers are a rarity! 

By: Dr. Anil Seth

The author is a consultant by profession and can be reached at seh.anil@gmail.com

The AMP Factor

Can Make Even Windows Pose as a Web Server

As a Web developer, you need a Web server but you're stuck on Windows. Yet, there's a much better world beyond IIS. We present you an overview of the free(dom) alternatives.

Developing a dynamic Web page is always fun, as well as a challenge for the Web developer. However, during recession times like this, when development of a portal right from scratch is all the more exacting and you are on the look out for a platform and development software that's free or comes with the minimum cost, a platform-independent FOSS tool is always a boon.

To begin with, WAMP (similar to a LAMP stack) is a collection of programs that has been used in combination to support Web development and can convert your Windows machine into a full-fledged Web server. WAMP is an acronym for its primary components -- Windows, Apache, MySQL and PHP/Perl/Python.

While you can find a whole gamut of WAMP packages around, we've picked up some of the best available in the Windows world.

XAMPP

XAMPP ('X' stands for cross-platform) is available for free download, and contains one of the most common Web development technologies in a single package. Its small size and portability is its USP.

XAMPP requires only one EXE file to be downloaded and runs with little or no requirement to configure the various components that make up the Web server. XAMPP is regularly updated to incorporate the latest releases of Apache/MySQL/PHP and Perl. It also comes with a number of other modules, including OpenSSL, *mod_perl*, zend optimiser and phpMyAdmin.

Self-contained, multiple instances of XAMPP can exist on a single computer, and at any given instance can be copied from one computer to another, making it very portable.

It is offered in two versions: a full (standard) version and the smaller XAMPP Lite.

Uniform Server

The Uniform Server is another WAMP package that is light (under 10 MB) and does not require installation for activation. It is thus a sought after tool by both novice Web masters and skilled developers alike, to test and develop Web applications on Windows, using FOSS.

The entire package is very portable and can be carried in a USB drive and used on any Windows system. Developers also use the Uniform Server to test their applications made with either PHP, MySQL, Perl or Apache. A number of plug-ins can be installed according to requirements. For example, a small plug-in like UniTray allows you to command and control your

server from the system tray. SlimFTPD is a small and easy to use FTP server that can be used with the Uniform Server to access your server with an FTP client.

EasyPHP

EasyPHP is another package that includes the complete AMP stack as well as easy development tools for websites and applications. It also enables a fully executable PHP. At just 15.6 MB, this is another portable application that can be easily carried on a USB. With this portable application, you can carry your developed application along with the server.

Apache2Triad

Apache2Triad bundles some of the most used open source servers and interpreters for developing Web content on the Windows platform.

The development of Apache2Triad has ceased but it has almost all the servers, interpreters and user interfaces that are already configured and ready to use. It contains Apache, MySQL, PostgreSQL, XMaiL (e-mail server) and SlimFTPD (FTP server). It comes with different interpreters such as PHP, Perl and Python.

Apache2Triad also makes life easy with the following GUI tools: Apache2TriadCP (control panel), phpMyAdmin (MySQL GUI), phpPgAdmin (PostgreSQL GUI), phpSQLiteAdmin (SQLite GUI), AWStats (webserver monitor), UebiMiau (E-mail client), PHPXmail (XMaiL GUI), and PHPsFTPD (SlimFTPD GUI).

WampServer

WampServer, formerly known as WAMP5, is a software package bundled with the AMP stack. It also comes with PHPMyAdmin and SQLiteManager to manage databases. It is one of the most used Windows Web development environments.

It is supposed to be the only solution that allows reproduction of the production server. It is possible to install all new releases of Apache, MySQL and PHP as add-ons. You can even have multiple instances of the server. Moreover, it comes with a service manager as a tray icon that allows better and easy management of the server.

There are many other similar OSS packages available. You can find a detailed comparison of all the packages at en.wikipedia.org/wiki/Comparison_of_WAMPs. 

By: LFY Bureau



S.G. Ganesh

Using Bitwise Operators Instead of Logical Operators

Some bad programming practices become established as habits over time. Here's an example of one such bad practice.

In the last few years, I have come across many code segments in which bitwise operators were used instead of logical operators. I thought it was a mistake that only novice programmers make. But recently, while reading the book, *Software Engineering* by Ian Sommerville^[1], I found that he has made the same mistake. His book is well respected and is one of the most widely read on the subject. So I decided to write about this problem this month.

Consider the following Java code (from Ian's book):

```
if( n < 0 | n%2 == 1)
    throw new NumericException();
```

This code is a straightforward code: it is to ensure that n is a positive even integer—if n is some other value, a *NumericException* is thrown. In this code, the `|` (bitwise-OR) operator is used instead of the `||` (logical-OR) operator; the condition should have been this: $(n < 0 \parallel n \% 2 == 1)$.

In my experience, I have seen that most programmers who use `|` instead of `||` also use the `&` instead of the `&&` operator for Boolean operands. In fact, as I had guessed, in the subsequent few pages in the book, there was an expression in an assert statement that used `&` instead of the `&&` operator! In other words, for many programmers, using bitwise operators instead of logical operators becomes a (bad) habit.

Coming back to the code; yes, it will work: if $n < 0$ or $n \% 2 == 1$ is true, then the `if` condition will evaluate to *true* and hence the exception will be thrown. So, why bother? To answer that, we'll have to understand some more details about the behaviour of bitwise and logical operators.

First, let us compare the truth table for the `|` and `||` operators:

A	B	A B	A B
T	T	T	T
T	F	T	T
F	T	T	T
F	F	F	F

Here, A and B are Boolean values, and T and F stands for *True* and *False*, respectively. The results for `A | B` and `A || B` look exactly the same! Yes, it's true, and that's why programs that make use of `|` instead of `||` for Boolean operands mostly work correctly. But why is it only 'mostly'?

The answer is that the truth table is not entirely correct.

[1] *Software Engineering*, 8th Edition, Ian Sommerville, Addison Wesley, 2006

For logical operators, there is a type of behaviour called 'short-circuiting': the expression is evaluated only till the truth value of the whole expression is known. Here, when A is true, no matter what the value of the other argument (B) is, the result for the `||` operator is true. So, B is a 'don't care' value and will not be evaluated. Whereas, for bitwise operators, the whole expression is always evaluated.

As you can see, this difference can cause subtle bugs in code. Here is a code segment (from real-world software) that has a serious bug:

```
if( container != null & !container.isEmpty() )
    return container.getLength();
```

Here, when `container` is null, the second argument `(!container.isEmpty())` is still executed, which would result in a null pointer access exception. Here, `&&` is the correct operator to use: in which case, when the container is null, the expression becomes false and hence the second argument will not be executed.

Programmers use bitwise and logical operators interchangeably for Booleans for various reasons. One main reason is efficiency: bitwise operators execute faster (doing bit-manipulation in CPU registers, which is faster) than logical operators (which internally perform a control transfer, which is slower). For most programmers, using such operators interchangeably creates confusion, and hence it's best to avoid this practice for reasons of efficiency—unless, for instance, it is embedded code where efficiency is very important. Another reason is ignorance: many programmers don't understand such subtle differences between the bitwise and logical operators. If the programmers come with a background in a 'non C-based' language, it is possible that they might make this mistake (many high-level languages do not support bitwise operators, so they use it interchangeably for Booleans).

We'll give Ian Sommerville the benefit of doubt: he might have a background steeped in some other language. However, as programmers, we should be careful about the programming practices we follow since many of them become habits later.



About the author:

S G Ganesh is a research engineer in Siemens (Corporate Technology). His latest book is "60 Tips on Object Oriented Programming", published by Tata McGraw-Hill. You can reach him at sgganesh@gmail.com.

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Sandya Mannarwamy

Welcome to another instalment of 'CodeSport'. In this month's column, we will look at finding the inversion of a given permutation. We'll then discuss how to write efficient and correct code for multi-threaded applications.

Thanks to all the readers who had sent in their comments to the problems we discussed in the previous issue. Last month's takeaway problem was on finding the number of inversions in a permutation. Inversions form the basis for analysing the time complexity of sorting algorithms.

The inversion of a permutation is defined as follows:

- Permutation: 6 2 3 1 4 7 8 9 5
- Inversion: 3 1 1 1 4 0 0 0 0

Here, 1 has an inversion 3 as there are three elements greater than 1 that are left to 1 in the given permutation, and these are 6, 2, and 3. Similarly, 2 has an inversion 1 because there is only one element left to 2 which is greater than 2, and that is 6. The problem was to find the inversion of a permutation in the $O(n\log n)$ time complexity even at the cost of some memory.

Since I did not get any completely correct solutions, I am going to keep this question open for readers to respond to through this month also. Just to give you all a hint, recall the fact that a merge sort has a time complexity of $O(n\log n)$. Can the merge sort algorithm be modified to get the correct solution to the above question? Remember that a sorted array has no inversions.

This month's discussion

Most of the readers of LFY would know about the advent of multi-core processors and how they are likely to lead to a proliferation of multi-threaded software development. I had a few readers who had written in, requesting for a discussion on coding issues related to

writing multi-threaded code. Therefore, for the next three columns, we will be focusing on multi-threaded code, discussing some basic concepts of concurrency, what are the issues that a developer faces when writing multithreaded code, and what pitfalls he should try to avoid.

Why should I make my code multi-threaded?

You may ask why is there a sudden focus on multi-threaded code development. After all, as per Moore's law, processor speed doubles approximately every 18 months, thereby allowing the developer to take advantage of faster processors to speed up his applications. Well, the answer is that processor vendors are now finding that we have reached the limits of Moore's Law and it is no longer possible for the developers to depend on newer chips with faster clocks to speed up their applications. Why is that so? Due to thermal power and chip area restrictions, processor vendors are turning to multi-core processor designs, wherein each chip contains multiple cores, rather than speeding up the clock frequency of the processor itself. This in turn means that a single-threaded application running on one core of a newer multi-core processor can in fact run slower on that than on your existing and older non multi-core processor (which has a higher clock frequency). So if you are a software developer, to take advantage of these newer multi-core processors, you need to write multi-threaded code so that each thread can run on a separate core, thereby parallelising your application and making

it runs quicker, overall. Hence, more and more software developers are turning to writing multi-threaded code in order to improve their application performance on multi-core processors.

One of the earliest and best articles to call attention to this paradigm shift was “The Free Lunch Is Over: A Fundamental Turn Toward Concurrency in Software” by the well known software guru, Herb Sutter. Interested readers can find this at www.gotw.ca/publications/concurrency-ddj.htm. It is a must read for every software developer who plans to write multi-threaded code.

Why is writing multi-threaded code difficult?

Writing robust multi-threaded code that gives a good performance is totally a different ball game. It is not just learning a new API or new language. It requires a major shift in the mindset of developers, since for every line of code in an application, developers need to answer the following questions:

- Can more than one thread execute this line of code simultaneously?
- What is the data getting read/written in this line of code?
- Can some other thread read/modify this data simultaneously?
- How do I ensure that my application is making forward progress?
- Can this line of code containing a call to *lock_acquire* lead to deadlocking my application?

Most programmers are conditioned to think in sequential mode. It is much easier to envisage an event ‘A’ as happening sequentially after an event ‘B’ instead of having to visualise whether parts of event ‘A’ can be interleaved with parts of event ‘B’. However, since thread scheduling is non-deterministic, in order to facilitate robustness, multi-threaded code development requires that access to shared resources including data, should be protected by means of synchronisation. Threads also need to communicate with each other and exchange data, as part of the application logic.

The requirement that threads need to use proper synchronisation in order to protect shared accesses leads to two of the most dreaded problems in multi-threaded software development, namely, (a) race condition and (b), deadlock.

Data race conditions

Consider the following piece of code:

```
static class TicktCounter {
    static int curr_ticket_counter = 0;
    static int GetNextTicketId() {
        return curr_ticket_counter++;
    }
}
```

While the above snippet of code would be perfectly correct in providing a unique ticket ID to each caller in a single-threaded application, do you see what can happen if it is invoked in a multi-threaded application where more than one thread can call the *GetNextTicketId* function concurrently? It is possible that two threads are given the same ticket ID in this case. How can this happen? The single line of code ‘*return curr_ticket_counter++*’ actually consists of the following three actions:

- Read the current value from the shared *curr_ticket_counter* variable into a register.
- Add 1 to that register value.
- Write the register value back to the shared variable *curr_ticket_counter*.

Two threads executing this same function concurrently can both read the same value from *curr_ticket_counter* (say, 100), increment their local register to 101, and publish the same resulting value. Hence both threads get the value of 100 from the function. Why did this happen? This inconsistency occurred because the simple statement ‘*curr_ticket_counter++*’ appears atomic to the developer writing the function ‘*GetNextTicketId*’ whereas it is actually not atomic. Hence, there is a race on the shared variable ‘*curr_ticket_counter*’ and this code has a race condition.

A data race occurs in a multi-threaded program when two threads access the same memory location without any intervening synchronisation operations, and at least one of the accesses is a write.

Now, how can we modify the above code to avoid the data race on the variable ‘*curr_ticket_counter*’? The obvious answer is synchronisation, namely, using a lock to protect the access to the shared variable:

```
static int GetNextTicketId()
{
    int my_ticket;
    pthread_mutex_lock(&l);
    my_ticket = curr_ticket_counter++;
    pthread_mutex_unlock(&l);
    return my_ticket;
}
```

Can we assume that if we lock before accessing the shared variable and unlock after accessing the shared variable meticulously, our multi-threaded code will always work correctly? The answer is not as simple as that. You can use lock/unlock function around every shared variable access and still end up with an inconsistent multi-threaded code. Consider the following code snippet:

```
void Withdraw (int account, int money)
{
    pthread_mutex_lock(&account_lock /* for that account */);
    //get the curr_balance for this account and increment it
```

```

curr_balance[account] = curr_balance[account] - money;
pthread_mutex_unlock(&account_lock /* for that account*/);
}

void Deposit (int account, int money)
{
    pthread_mutex_lock(&account_lock /* for that account */);
    //get the curr_balance for this account and increment it
    curr_balance[account] = curr_balance[account] + money;
    pthread_mutex_unlock(&account_lock /* for that account */);
}

```

The above code contains two functions: *Withdraw*, which debits a bank account with a specified amount of money by decrementing the shared variable *curr_balance*; and the function, *Deposit*, which increments *curr_balance* by the amount being deposited. As we can see, both the accesses to *curr_balance* are properly protected by the same lock *account_lock* and everything seems absolutely correct. So what can be the problem?

A new developer maintaining the code decides to add a function called *transfer*, which allows a customer to transfer money from account A to account B. He implements the function, *transfer*, as follows:

```

void Transfer (int from_account, int to_account, int money)
{
    Withdraw(from_account, money);
    Deposit(to_account, money);
}

```

What is wrong with the above piece of code? Well, since we have a multi-threaded program, let us assume that we have a thread that queries and adds up the total balance in all accounts. Let us further assume that this thread queries the *curr_balance* in each account to calculate the total balance. If this thread is scheduled and queries the *curr_balance* in *from_account* and *to_account* in the time period between the call to *Withdraw* and the call to *Deposit* in the function *transfer*, it will find that *curr_balance* in the *from_account* has been debited while the *curr_balance* in the *to_account* has not been incremented yet. There is this time window where the money is missing completely from the books of the bank and the balance reporting thread will report incorrect results.

So where did we go wrong? We did acquire the locks correctly in both the *Withdraw* and *Deposit* functions. However, we missed the point that the function *Transfer* should be an atomic operation, and that both debiting the *from_account* and crediting the *to_account* should be done atomically. Hence the correct code for *Transfer* should look as follows:

```

void Transfer (int from_account, int to_account, int money)
{

```

```

pthread_mutex_lock(&account_lock /* for 'from_account' */);
pthread_mutex_lock(&account_lock /* for 'to_account' */);
curr_balance[from_account] = curr_balance[from_account] - money;
curr_balance[to_account] = curr_balance[to_account] + money;
pthread_mutex_unlock(&account_lock /* for 'from_account' */);
pthread_mutex_unlock(&account_lock /* for 'to_account' */);
}


```

Transferring money from one account to another needs to be performed as a single atomic transaction. Hence the locks required for both the accounts need to be held while we debit one account and credit the other. Else the system state as seen by an external entity can be inconsistent, as we realised in the example above. We will continue our discussion on atomicity, race conditions and deadlock in next month's column.

This month's takeaway problem

This month's takeaway problem is again to do with multi-threaded code and is quite simple. Can you detect what may be the issue in the following code snippet:

```

void BookTicket(int row, int column)
{
    pthread_mutex_lock(&row_lock );
    pthread_mutex_lock(&column_lock);
    ticket[row][column].status = 'booked';
    pthread_mutex_unlock(&column_lock);
    pthread_mutex_unlock(&row_lock);
}

void CancelTicket(int row, int column)
{
    pthread_mutex_lock(&column_lock );
    pthread_mutex_lock(&row_lock);
    ticket[row][column].status = 'cancelled';
    pthread_mutex_unlock(&row_lock);
    pthread_mutex_unlock(&column_lock);
}

```

Note that two threads can concurrently issue booking and cancellation requests to the same ticket (same row and same column) and the system has to work correctly.

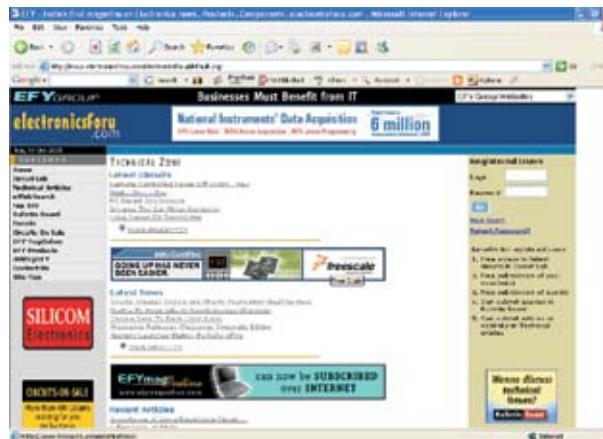
If you have any favourite programming puzzles that you would like to discuss on this forum, please send them to me. Also, do send your solutions and feedback to *sandyasm_AT_yahoo_DOT_com*. Till we meet again next month, happy programming!



About the author:

Sandy Mannarswamy. The author is a specialist in compiler optimisation and works at Hewlett-Packard India. She has a number of publications and patents to her credit, and her areas of interest include virtualisation technologies and software development tools.

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A Voyage to the Kernel



Part 13

Segment 3.2: Day 12

In the last column we focused on some of the fundamentals in kernel programming. We are going to dedicate today's voyage to reviewing some more basic literature.

*A*s I mentioned before, present day CPUs can run in two modes -- kernel mode and user mode. Interrupt drivers and operating system services are examples of those that can run in kernel mode. In this mode, free access to the entire memory and device registers are supported with the help of an 'extended set' of instructions. While when the CPU runs in user mode, it will have access only to a specific restricted set of instructions (the CPU cannot use the entire memory in this case). These two modes are used for security reasons. This, in turn, provides reliability to the operating systems. Normally, a program uses the user mode (which is 'safer'). When it needs more utilities and restricted resources, it will switch over to the kernel mode. Systems calls are used to access kernel utilities and are essentially operating system services. These software interrupts are processed by the OS as kernel mode processes.

We can see a system call list maintained by the OS and it has respective pointers to the functions that can implement the calls in the kernel. Here, you can see a list of such system calls (from the *syscall.h* file):

```
#ifndef _SYSCALL_H
#define _SYSCALL_H 1

/* This file should list the numbers of the system the system
   knows.

   But instead of duplicating this we use the information
   available
   from the kernel sources. */
```

```
#include <asm/unistd.h>

#ifndef _LIBC
/* The Linux kernel header file defines macros '__NR_<name>', but some
   programs expect the traditional form 'SYS_<name>'. So in
   building libc
   we scan the kernel's list and produce <bits/syscall.h> with
   macros for
   all the 'SYS_' names. */
#include <bits/syscall.h>
#endif

#endif
```

This code is taken from the GNU C library. Here, you can see a dependency file. And you may find some of those included in the sidebar on 'syscalls'.

OS services can be well accessed using these calls. In the last column, we discussed the module programming part. There we stumbled upon two types of modules—essential and loadable. As the name suggests, the loadable ones can be loaded (or unloaded) based on the needs of the user (or program). These modules can provide extra utilities and modes to the kernel. As most of the readers would be aware of the basic differences between a micro kernel and a monolithic one, you can understand why some of them are arguing for micro kernel model!

If a new functionality offered by the 'module' has to be added directly to the original code, then it will be tedious, as you need to rebuild it every time you add a new portion of 'extra code'!

The kernel programming can be really hectic because of the long debugging cycle. Thus, we go for loadable modules in kernel development. Linux is a modern monolithic kernel that can support loadable ‘modules’. We have already seen how to write a simple module. And here we will investigate more about the process.

If you use loadable modules for programming purposes, then you need not reboot the system every time. I will illustrate this with the help of an example:

```
#include <stdio.h>
int main(void)
{
    FILE *samplefile;
    char tempstring[1024];
    if(!(samplefile=fopen("/etc/passwd","r")))
    {
        fprintf(stderr,"System could not open the file\n");
        exit(1);
    }
    while(!feof(samplefile))
    {
        fscanf(samplefile,"%s\n",tempstring);
        fprintf(stdout,"%s\n",tempstring);
    }
    exit(0);
}
```

The above code can be used to open a particular file and print the contents of the file. It should be noted that the system calls and library functions are different things. The main difference is that library functions are not attached to the kernel.

In the code, we have tried to use *fopen* (which is not a system call) to open the *passwd* file. But we can see the system calls invoked by a program by using the *strace* utility.

Few important syscall declarations

- #define SYS_adjtimex __NR_adjtimex
- #define SYS_afs_syscall __NR_afs_syscall
- #define SYS_alarm __NR_alarm
- #define SYS_brk __NR_brk
- #define SYS_capget __NR_capget
- #define SYS_capset __NR_capset
- #define SYS_chdir __NR_chdir
- #define SYS_get_mempolicy __NR_get_mempolicy
- #define SYS_get_robust_list __NR_get_robust_list
- #define SYS_get_thread_area __NR_get_thread_area
- #define SYS_getcwd __NR_getcwd
- #define SYS_getdents __NR_getdents
- #define SYS_getdents64 __NR_getdents64
- #define SYS_getegid __NR_getegid
- #define SYS_pipe __NR_pipe
- #define SYS_pipe2 __NR_pipe2
- #define SYS_pivot_root __NR_pivot_root
- #define SYS_poll __NR_poll
- #define SYS_ppoll __NR_ppoll
- #define SYS_prctl __NR_prctl
- #define SYS_msgctl __NR_msgctl
- #define SYS_msgrget __NR_msgrget
- #define SYS_msgrcv __NR_msgrcv

Because of space constraints, I could not include all the calls here. But we will be discussing them in future columns.

```
mmap2(0xb7ed2000, 12288, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x158) = 0xb7ed2000
mmap2(0xb7ed5000, 9840, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0xb7ed5000
close(3) = 0
mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7d79000
set_thread_area({entry_number:-1 -> 6, base_addr:0xb7d796b0, limit:1048575, seg_32bit:1, contents:0, read_exec_only:0, limit_in_pages:1, seg_not_present:0, useable:1}) = 0
mprotect(0xb7ed2000, 8192, PROT_READ) = 0
mprotect(0x8049000, 4096, PROT_READ) = 0
mprotect(0xb7f17000, 4096, PROT_READ) = 0
munmap(0xb7ed8000, 137651) = 0
brk(0) = 0x854e000
brk(0x856f000) = 0x856f000
open("/etc/passwd", O_RDONLY) = 3
fstat64(3, {st_mode=S_IFREG|0644, st_size=1969, ...}) = 0
mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7ef9000
read(3, "root:x:0:root:/root:/bin/bash\n", 4096) = 1969
fstat64(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(136, 0), ...}) = 0
mmap2(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0xb7ef8000
.....
.....
write(1, "administrator...:/var/lib/postgr", 47administrator...:/var/lib/postgresql/bin/bash
```

```

) = 47
read(3, "", 4096)      = 0
write(1, "jetty:x:118:65534::/usr/share/jetty", 47jetty:x:118:65534::/usr/
share/jetty/bin/false
) = 47
exit_group(0)          = ?
Process 16610 detached

```

A close review of the above lines will give you a lucid picture about the invoked actions. Now, we will look at how to load the module. Let's have some new code:

```

#include <linux/kernel.h>
#include <sys/syscall.h>
#include <linux/module.h>

extern void *sys_table[];
asmlinkage int (*main_sys_exit)(int);
asmlinkage int alt_exit_function(int err_code)
{
    printk("Sys_exit called with err_code=%d\n",err_code);
    return main_sys_exit(err_code);
}
int init_module()
{
    main_sys_exit=sys_table[__NR_exit];
    sys_table[__NR_exit]=alt_exit_function;
}
void cleanup_module()
{
    sys_table[__NR_exit]=main_sys_exit;
}

```

You can run:

```
gcc -Wall -DMODULE -D__KERNEL__ -DLINUX -c sample2.c
```

...to compile the code (which is assumed to be saved as *sample2.c*). Then you can use:

```
insmod filename.o // where filename is your file name
```

...to insert this module. You can use *lsmod* to list the loaded modules.

When a system function is initiated by a program, the process switches to kernel mode. In the x86 family architecture, a system call is normally initiated by the software interrupt 128 (0 80) being triggered. Now, let's take the case of the memory. In some cases, we may require dynamic memory allocation. An apt example is when you deal with temporary buffers. The functions used for this are *kmalloc()* and *kfree()*, which are implemented in the *kmalloc* file:

```

void * kmalloc (size_t size, int priority);
void kfree (void *obj);

```

```
#define kfree_s(a,b) kfree(a)
```

It is good to note that static memory allocation is also handled in a similar way. The initialisation routine for character-oriented devices for this is handled by:

```
memory_start = console_init(memory_start,memory_end);
```

For mapping functions we can have the functions in the header file *sys/mman.h*:

```

extern caddr_t mmap (caddr_t addr, size_t len,
int prot, int flags, int fd, off_t off);
extern int munmap (caddr_t addr, size_t len);
extern int mprotect (caddr_t addr, size_t len, int prot);
extern int msync;

```

An overview of the Linux kernel

We have seen some basic aspects of modules. Before we proceed, we need to go over some more general ideas about the Linux kernel. This is required for writing new modules and building your own custom kernel. In fact, there are some quick methods you can employ while making a custom package. For example, you can get the list of modules required to run during the boot process by looking at the kernel configuration (which is located in your current distribution's kernel package).

We can generally classify the Linux files as:

- Regular files
- Directory
- Symbolic link
- Block-oriented device files
- Character-oriented device files
- Pipes (also called 'named pipes')
- Sockets

Beginners should note that Linux treats even directories as files. We prefer GNU/Linux OS because of its unique features. For novices, let me summarise some of the main features here:

- Multi-tasking (here processes run independent of each other)
- Multi-user access (Linux allows a number of users to work at the same time)
- Multi-processing (supports multi-processor architectures)
- Architecture independence (works on a variety of hardware platforms)
- Support for loadable executables
- Paging *
- Dynamic cache for hard disks
- Shared libraries
- Support for POSIX
- Different formats for executable files
- Memory protected mode
- Support for national keyboards and fonts
- Different file systems are supported

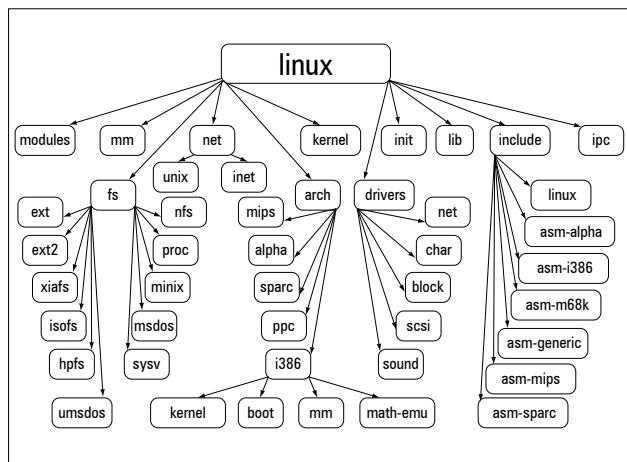


Figure 1: Linux in a tree structure.

- **TCP/IP, SLIP and PPP support**

*Though there are different mechanisms for efficient memory management, sometimes it may be eaten away. In that case, the OS looks for 4 KB memory pages that can be made free. Then the pages whose contents are already stored on the hard disk are identified and discarded.

The ability to support modules is really an amazing feature. In fact, there are few differences between normal programs and modules. In the case of normal C programs, they usually begin with a `main()` function and then execute a set of instructions. But in the case of modules, there will be an `init_module` or the function you point using the `module_init` call. This essentially speaks about the functionality that it can provide. And these modules end by calling `cleanup_module` (or like in the first case, the function you specify using a `module_exit` call).

We have seen that for a system call to perform, there should be a transition from user mode to the system mode. This is handled with the help of interrupts.

The parameters `sys_call_num` and `sys_call_args` are used to represent the number of the system call and its arguments. For example, we can have:

```
SAMPLE system_call( int sys_call_num , sys_call_args )
```

Let's look at some examples to comprehend this in a better way.

```
getpid (and getppid)
#include <sys/types.h>
#include <unistd.h>
```

```
pid_t
getpid(void);

pid_t
getppid(void);
```

The `getpid()` system call basically returns the process ID of the calling process. But it should not be used for constructing temporary file names due to security reasons.

For this purpose, we can use:

```
asm linkage int sys_getpid(void)
{
    return currcnt->pid;
}
```

Remember the `printk` we have used before? Beginners might find it hard to cope with new functions (which may appear undefined to them). To put it in simple words, I can say that there are functions available to modules. Here, too, you can find an included header file (more details about the subject can be accessed at en.wikipedia.org/wiki/Unistd.h).

And now let me describe a few commands (and their actions) for your reference. It will be useful when we proceed further:

- **kill** (send a signal to a process)

```
#include <sys/types.h>
#include <signal.h>
```

```
int
kill(pid_t pid, int sig);
```

- **init** (process control initialisation)

```
init
init [0 | 1 | 6 | c | q]
```

- **telnetd**

```
/usr/libexec/telnetd [-46BUhlkn] [-D debugmode] [-S tos] [-X
authtype]
[-a authmode] [-e debug] [-p loginprog] [-u len]
[-debug [port]]
```

- **gethostname, sethostname**

```
#include <unistd.h>
```

```
int
gethostname(char *name, size_t namelen);
```

```
int
sethostname(const char *name, int namelen);
```

We will continue to dedicate a few more days to review the literature. Happy kernel hacking! 

By: Aasis Vinayak PG

The author is a hacker and a free software activist who does programming in the open source domain. He is the developer of V-language—a programming language that employs AI and ANN. His research work/publications are available at www.aasisvinayak.com



High-performance Computing on a 3×3-Inch Board

The Beagle Board is a generic board powered by an OMAP3530 processor. It is backed by a highly-active community, which maintains its own portal that invites discussion, queries, ideas and other inputs from all over the world—the first of its kind.

The Beagle Board, an open source initiative by Texas Instruments, was launched to the public around a year back. It was developed by a small team at Texas Instruments, led by Khasim Syed Mohammed, who's the lead developer for open platforms at TI. It's called the Beagle Board because of its dimensions. A beagle is a breed of short and cute dogs, which the team found similar to this 3x3 inch (7.6x7.6 cm) board. It's a low-cost, fan-less, single board computer with a high performance embedded platform, which is based on Texas Instruments' OMAP3530 technology.

"The idea of a Beagle Board was born a year back and I have been involved in this initiative from the very beginning. It took six months for the team to convert this idea into a reality. I started with hardware enablement for this initiative with boot loaders, the Linux kernel and drivers, validation, documentation, promotions, etc," notes Syed. "Ever since its launch, I've been promoting Beagle Board among university students and the small-scale IT sector in India, continuing in enabling a global community to be built around OMAP3 technology. Apart from other activities, I've also

been working to demonstrate the capability of OMAP3 architecture in the medical, infotainment, portable navigation and low-power industrial sectors."

The interesting point to note here is that the board is targeted at the open source developers, which seemed obvious considering the lead developer's passion for open source. "I was interested in computers right from my early days. After my school, I started learning computers and during my internship on TI's DSP, my curiosity for embedded applications increased enormously. Moving forward, I found open source to be more useful since it was free and gave me all the necessary software blocks 'with source' to build end-to-end solutions," reveals Syed. "I started as a user/consumer of open source software and forums. While working closely with the OMAP Linux community, I found significant gaps in our offerings to the open community. I joined Jason Kridner and Gerald Coley at TI to bridge and address these gaps through beagleboard.org."

He adds: "I am an enabler and a contributor of open software in the community. The demand for consumer devices is growing

at a fast rate and we need to match this pace of demand and supply. Open source initiatives will be playing a major role in building an open ecosystem to enable innovations, implementing them in products and to meet the global demand for consumer products. These are some of the areas that I've been trying to cater to through the Beagle Board initiative."

Open source software is in fact embedded into the board—it consists of a boot loader, various libraries, Linux kernel and applications running on top of it.

What's in a board?

The revision C of Beagle Board was introduced in May 2009—in India, Cranes Software International is the official distributor. So, coming back to our real question: what can a developer look for in the board?

First, the OMAP3530 processor. OMAP3530 is a high end, multi-core, application processor with ARM Cortex A8, Generic C64x DSP and an SGX 3D graphics accelerator. With the ARM running at 600 MHz, DSP at 430 MHz, SGX at 111MHz, the effective total system power becomes 1.2GHz. This gives developers an opportunity to explore a variety of desktop applications on hand-held devices with much lower power consumption compared to any other x86 or Intel Atom-based devices. What's even more interesting is that the board can run desktop

applications—the OpenOffice.org office suite, GIMP, Firefox, etc—with only 2 watts of power consumption. With respect to heat dissipation, the OMAP3530 processor is rather superior. There's no need for any sort of cooling device (like a heat sink or a fan) as the temperature remains below 50 degrees Celsius. Now, that's what we call an ideal green computing device.

Although there are a lot of interfaces available on the board, the high speed USB and USB OTG are worth mentioning first. A single high-speed USB on the board can be used to connect 128 devices with the help of a hub. However, when we use a high speed USB port, the USB host acts only as the master and the device acts as a slave. A USB OTG allows the host to behave either as a master or a slave, but not at the same time. When the USB OTG is behaving as a host, it should be connected to a 5V power supply. But, when connected to a PC, it behaves as a slave.

It's no surprise that the device, according to the manufacturers, is aimed at exploring and developing applications on OpenGL, OpenMax, OpenOffice.org, Open CV, Browsers, 3D gaming, GStreamer, 3D UI, etc. But would the device be able to run all these applications in parallel? In which case, how much power will the device typically consume? Would a cell phone-like battery be enough to support it for hours? Also, how much RAM can be fitted into the board to take care of intensive multi-tasking?

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Board Specs

- OMAP3530 Processor
 - ARM 600MHz ARM Cortex-A8 (>1200 DMIPS)
 - Over 1 billion dhrystones per second with NEON and VFP extensions
 - 2D/3D graphics accelerator
 - C64x+ DSP and video acceleration
- 256MB DDR @166Mhz
- 256MB NAND
- High Speed USB 2.0 OTG
- High Speed USB HOST
- S-Video (TV out)
- DVI-D
- Stereo Audio Out & In
- 8-bit SD/MMC
- JTAG
- UART
- Expansion connector to provide extended connectivity with standard connections like:
 - I2C, MMC, SPI, GPIO
 - LCD expansion—The new LCD interface can be used with an adapter board to connect to displays, including RGB LCD panels and LVDS panels.
 - PWM—The expansion connector now provides three pulse width modulation (PWM) signals for motor driver functions or PWM signalling, typically used in robotics.

Syed quips, "The RAM is fixed for 256 MB and is not expandable; therefore memory requirement is a constraint to run all these applications in parallel. But it's a board limitation rather than one related to the processor. A cell phone-like battery is sufficient to support all these applications, but definitely not for hours when run in parallel. The OMAP3530 chip supports ~ 82hrs of audio (1400mAh) and ~ 4hrs of video (1400mAh)."

Moreover, the Beagle Board is also provided with a S-Video and a DVI-D port. They can be used for connecting to a TV and a monitor respectively. The UART is a serial port and it helps a developer for kernel-level debugging.

The JTAG cable that is provided can be used for JTAG-based simulator and low-level debugging. The device also has an 8-bit SD/MMC, which can be used as a hard disk. The PWM expansion connector provides three pulse width modulation (PWM) signals for motor driver functions or PWM signalling, typically used in robotics.

Now, what about the scope for expandability of the board? The board is designed to use standard (PC) peripherals like a DVI, keyboard, mouse, Ethernet, Bluetooth, Wi-Fi, hard disk (over USB), etc. You can upgrade/change/expand these peripherals based on need. The board also provides an expansion header that provides OMAP3530 pin outs to interface with any external device over SPI, MMC, I2C and GPIO interfaces. A few examples are:

1. Beagle is used by an open community member to build an open software defined radio—www.opensdr.com
2. The expansion header can be used to connect this to an ADC (analogue to digital converters), and process the live samples on DSP and use ARM for the host interface.
3. TI DLP Pico projector can be interfaced through the DVI interface on Beagle Board and the framebuffer content can be projected [dkc1.digikey.com/us/mkt/pico.html]
4. With Angstrom distribution ported, the board can be used as a regular desktop.
5. Android is supported by BeagleBoard.org community.
6. u-buntu (the Canonical port for ARM Cortex A8) will bring in thousands of apps on Beagle Board.

The bottom line is that, as a developer, you can use it for Web services, 3D gaming, for the Linux kernel and drivers, boot loaders and firmware, portable media and infotainment applications, the UI framework, high-end signal processing with generic DSP, OLPC applications like Sugar—in short, the possibilities are endless; you'll only

have to let your imagination run wild. Just to give you an idea, you might want to check out all the current projects that are under way at www.beagleboard.com/projects. So, what are you waiting for? Take a bite at this 'Open Platform'.

Syed notes, "While there are numerous theoretical concepts available today, these could be executed with 'Open Platforms', which is a new trend in the IT industry where products are defined, designed and developed by consumers across the world. Ideas are just like raw materials. They need enormous energy, effort and tools to convert them into end products. Collaboration in such efforts results in better execution." 

References and documentation

- Beagle Board community portal: beagleboard.org
- Technical reference manual for OMAP3530 processor: focus.ti.com/general/docs/gencontent.tsp?contentId=36915
- DSP LINK (for ARM-DSP communication): www.a-ti.com/downloads/sds_support/targetcontent/link/link_1_50/index.html
- Validation software, Linux device drivers, latest kernel from GIT: code.google.com/p/beagleboard/wiki/BeagleboardRevCValidation
- Board schematics: beagleboard.org/static/BBSRM_latest.pdf
- DSP Compiler: www.a-ti.com/downloads/sds_support/targetcontent/LinuxDspTools/download.html
- ARM Compiler: www.codesourcery.com/gnu_toolchains/arm/portal/release313
- More links and documentation: elinux.org/BeagleBoard & code.google.com/p/beagleboard
- Discussion list: [discussion at beagleboard.org](http://beagleboard.org)
- IRC: #beagle on irc.freenode.net

By: Atanu Datta and Abhijit Paul Choudhury

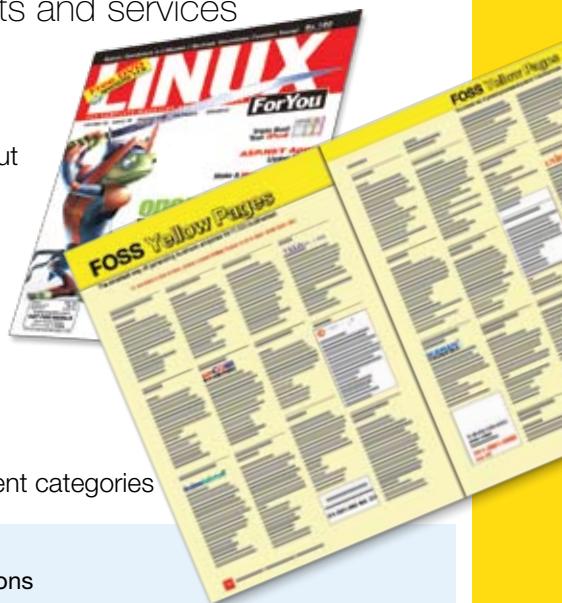
While Atanu likes to head bang and play air guitar in his spare time, Abhijit loves to hack on open source and is a gamer by heart. Oh, and they're also part of the LFY Bureau.

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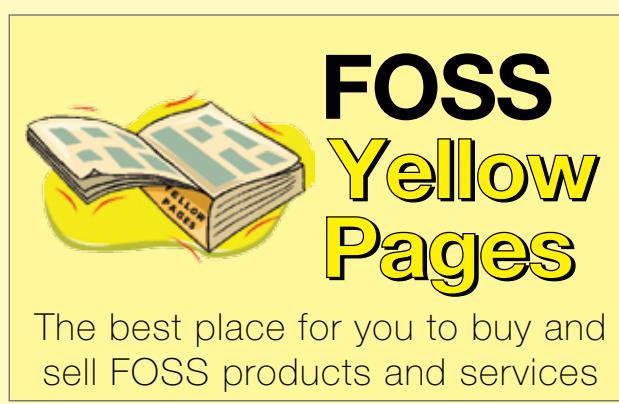
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Embedded System

Theme: **AUTOMOTIVE & AVIONICS**

Date: 28th & 29th of August 2009

Organized By:



#635/B, 2nd Floor, Dr. Rajkumar Road, 2nd Stage, Rajajinagar, Bangalore 560010

Ph: 080-65301070, 41616824 Mobile: +91- 9342333332, 9590000032 E-Mail id: standly@embedasia.com

Thank You IIT Madras

It was in your hostel room
that the idea was conceived



The first issue in Jan '69



The Dec '08 Issue

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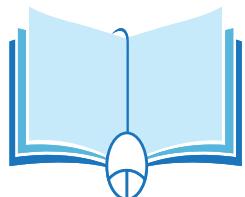
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TECH@EDU EXPO

EDUCATION. POWERED BY TECHNOLOGY.

13-14 June, 09. Pragati Maidan, New Delhi

A TECHNOLOGY SHOW FOR THE EDUCATION INDUSTRY

Demonstrate the state-of-the-art technology to thousands of educational & training institutes

Mobiles for distance education. Digitisation of curriculum. Innovative teaching aids.

Video-conferencing powered classes. State-of-the-art audio & video equipment.

Labs that power innovation and R&D...

...pretty exciting stuff—isn't it? But are these technologies really beneficial for educational institutions in India? Have these been implemented by any of the institutions here? If yes, how's been the experience? Most importantly, are these technologies worth the effort and investment?

These are some of the questions that will be addressed at Tech@Edu—a unique event aimed at showcasing the latest technologies that promise to benefit the Indian education sector. You will get to hear technology experts from the leading tech firms. Plus, there will be 'early adopters' from academia who will share their 'gyaan' based on their personal experiences.

Workshops & Seminars

State-of-the-art Labs

Audio & Video Systems

Simpler Management, Thanks to IT Solutions

Hi-tech Teaching Aids

e-Learning: Today & Tomorrow

Harnessing the Web and the Mobile

Open Source Powered Education

Visiting Institutions

- Schools
- Colleges
- Engineering institutions
- BBA/MBA colleges
- Education Trusts
- Education boards and societies
- Training institutions
- Examination bodies
- Government bodies

Visitor Profile

- Chairmen & Directors
- Senior faculty
- Head of departments
- Professors
- Lecturers
- Teachers
- Purchase Heads
- Trustees
- Principals
- Deans

For speaker slots: Vandana Sharma - 9810295045
email: contact.techedu@efyindia.com

For Booth/Sponsorship: Devendra Kumar - 9810143735
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EFY Enterprises Pvt Ltd, D-87/1, Okhla Industrial Area, Phase 1, New Delhi 110 020 Ph: 011-26810601-03; Fax: 011-26817563